Chemical Week

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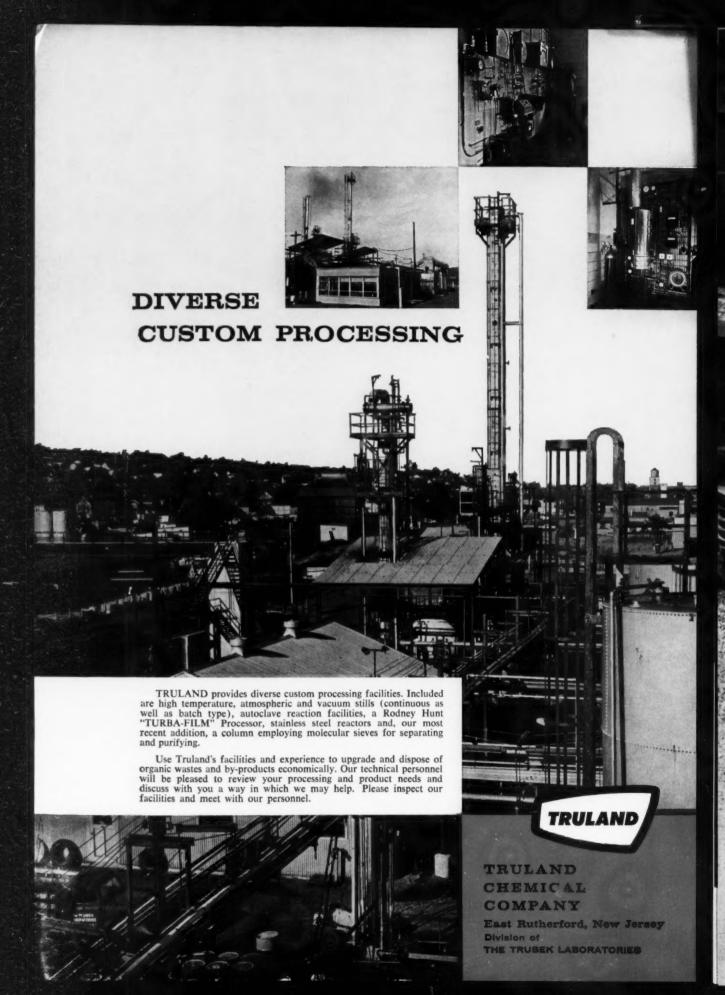
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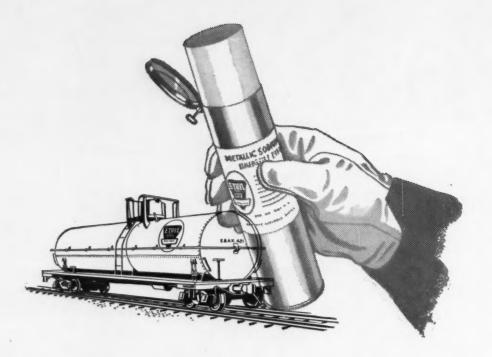
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ON THE COVER: V. J. Anhorn, manager of Goodyear's Organic Chemical Research, checks an isoprene sample from his company's bench-scale isoprene unit (p. 73).



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Tax Credits Not Enough

WE ARE ENCOURAGED by President Kennedy's separation of his tax credit scheme from the larger problem of depreciation allowances. Although he believes that tax credits will stimulate more expansion than accelerated depreciation for the same loss of tax revenue. he concedes that "proper methods of depreciation have a normal and important function in determining taxable income, wholly apart from any considerations of incentive. . . . It may be that on examination some of the existing depreciation rules will be found to be outmoded and inequitable; but that is a question that should be separated from investment incentives."

We strongly feel that current depreciation policy is outmoded, and we hope that the study now being made by Treasury officials and the upcoming consideration of reform bills by the Congress will result in constructive action.

In the meantime, what can we say about Kennedy's incentive plan? It will probably work. The net effect of the proposals is to reduce the cost of new plant and equipment, thereby reducing the rate of return necessary to justify a project. And with an ascending scale of credit as investment increases, companies will be inclined to boost their total investments. Also, the temporary nature of the proposed legislation will encourage firms to build now-before the law runs out.

Nevertheless, the plan has some serious flaws, as we pointed out a few weeks ago (March 25, p. 111). For the short term Kennedy is understandably more interested in speed than in justice; but his "pay now, get credited later" plan inequitably favors larger firms with ready cash. Also, since new capital spending must exceed 50% of depreciation to earn credits, it discriminates against firms that have just completed large expansions.

In summary, then, Kennedy's plan will work-but not fairly; and we still need permanent depreciation reform.

The Profitable "Nonprofits"

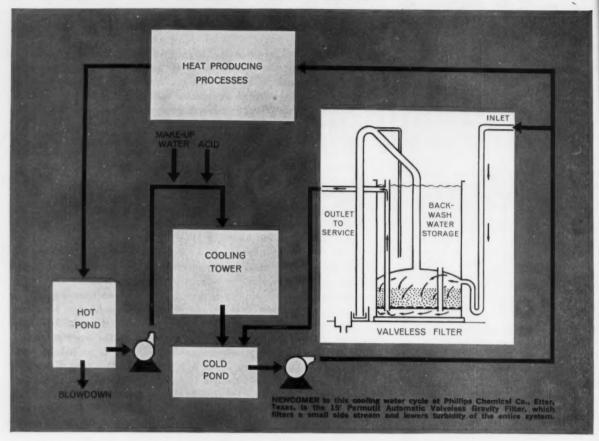
STANFORD RESEARCH INSTITUTE has earned our respect by working with the Internal Revenue Service and the Senate Finance Committee to clarify the tax status of nonprofit research institutions.

Earlier IRS interpretations were ambiguous; Stanford sought no special privileges and wanted to work within the law; it was willing to pay income taxes provided the distinction between taxable and nontaxable income was made clear.

The new rules (p. 49) are certainly a step in that direction. It is eminently just that profits accruing from work done exclusively for the benefit of a profitmaking corporation should be taxed. But there is still a fuzzy area: the exemption on work done in the "public interest" even though the information is not made public. This is subject to a broad spectrum of interpretations, since it is difficult to conceive of any research that isn't in the public interest—just as the clearly taxable operations of chemical firms, publishing houses, drug stores and laundries are in the public interest.

It is difficult and dangerous to try to distinguish between different types of research, deciding whether they are or are not in the public interest. It is much more clear-cut to distinguish between types of sponsorship. And profits from work done for the exclusive benefit of private, taxpaving sponsors should be taxed.

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A FAMOUS FLUID WITH TEMPERATURE CONTROL PROBLEMS

Wine has never been properly appreciated by enough people. Many think you simply press grapes, bottle the juice, and wait a while to create wine. Even those who pride themselves on their knowledge of this age-old drink are seldom aware of the artful thermal engineering required. Pasteurizing wine is actually one of the most tricky and delicate feats in the field of liquid processing.

Take temperatures. Wine must be pasteurized at 140°F. Those are the facts of life in the world of wine. They might not seem too difficult to live with unless you're in the wine or chemical processing business.

Take New York's Monarch Wine Company, producers of Manischewitz Wine. Their Problem: how to maintain the 140° temperature in the heat exchangers despite wide variations in the rate of wine flow. These variations, between 5 to 60 gallons per minute, result from slowdowns and recoveries in the bottling process. Problem: entire system must be capable of complete shutdown when necessary. Problem: wine temperatures must be raised to 140° as rapidly as possible, sometimes an immediate jump of 100°

Attracted perhaps by aspects of the situation that had little to do with pure science, Sarco engineers applied the collective experience of Sarco technology to the solution of this serious problem. The result for Monarch: the degree of control the process demanded—achieved through the excellent use of Sarco Temperature-Pressure Regulators, Float Thermostatic Steam Traps, Thermo-Dynamic Steam Traps, and Pipeline Strainers.

Sarco engineers, ever resourceful, divided each of the two large Cherry-Burrell plate-type heat exchanger units into two separate sections with a blank baffle plate, each with a separate Sarco control. Thermal sensing bulbs were installed in wine discharge and throttling controls hooked into steam supply. As demand fluctuates, one or both regulators function to maintain the 140° temperature.



In higher demand, both regulators are operative; as demand drops and flow decreases, only one regulator supplies steam. Pasteur himself would have been elated.

Each of six smaller capacity shell-and-tube heat exchangers required only one regulator, with the sensing bulb inserted into the outlet side of the wine filled shell, and the regulator throttling steam supply to the tube section. Thus, by controlling flow of steam to the exchangers on the basis of pressure and temperature, the Sarco regulators were able to maintain the temperature of the wine at precisely 140° regardless of fluctuations in demand or supply rate. Whew! A lot of engineering went into those two sentences.

From here on it's downhill. To secure complete cut off of the steam supply during scheduled shutdowns of the bottling run, solenoid valves were provided to supplement normal modulating action of the controls. To discharge widely varying loads of condensate continuously and remove immediately all air and incondensible gases, Sarco Float Thermostatic Steam Traps were installed on all condensate outlets. On the drips before each control valve a Sarco Thermo-Dynamic Steam Trap was installed to insure delivery of dry steam. Sarco Pipeline Strainers were installed before all steam traps and valves

to protect them against damage by any foreign bodies. And thus ends a classic story of the grape.

Still, this story has been condensed far too much, really, and we feel you've been cheated out of the story's more delicious details. You needn't be, however. We've printed the facts in detail for posterity and you in Sarco Case History 185, complete with drawings that practically make it a do-it-yourself kit. If you would like a copy, we will be flattered to receive your request, and dispatch it with dispatch.

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ANYONE FOR KEY CHAINS?

We seem to have these key chains. Want one? They're much more convenient than a case. A tiny replica of a Sarco Thermo-Dynamic Steam Trap, Type TD-50 is attached, but you can always remove it if you find it too commercial. There must be many things you could use these chains for. Fishing sinkers? Lengthening a light cord, maybe? Anyway, if your Sarco representative is out, write in.

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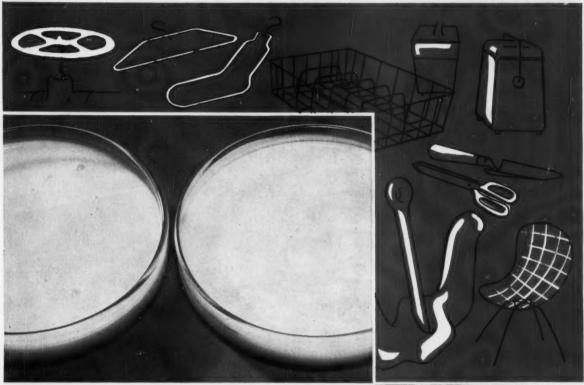
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Improve product performance. Silicone additives cause plastisols to flow faster and more evenly. This makes it easier for fabricators to produce continuous coatings that are free of pinholes and weak spots; to obtain sharper detail in moldings and castings.

Including Dow Corning Silicones in your plastisol formulas produces important end-product advantages, too. For example, silicones give added "slip" to such products as overshoes, furniture coverings, and bushings and that means greater resistance to marring, scuffing, and tearing. Another silicone benefit: a more lifelike feel for toys and dolls . . . a softer, more comfortable feel for gloves and rainwear.



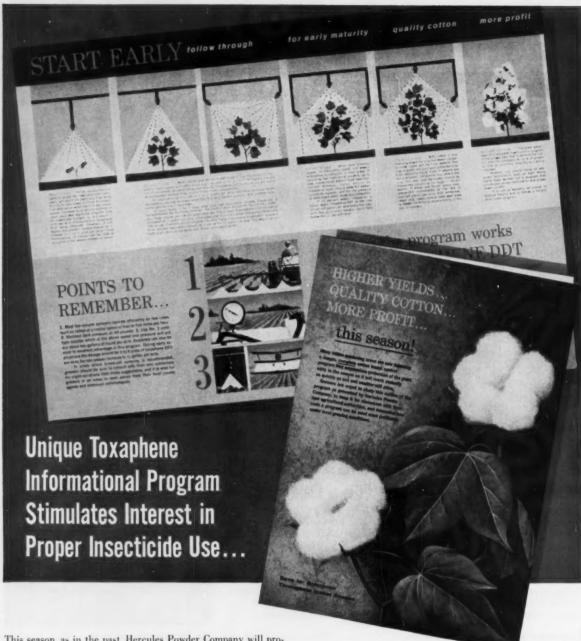
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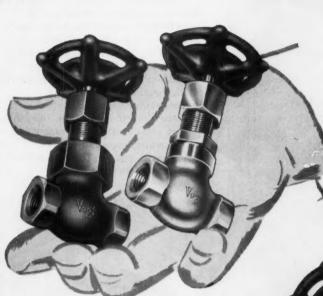
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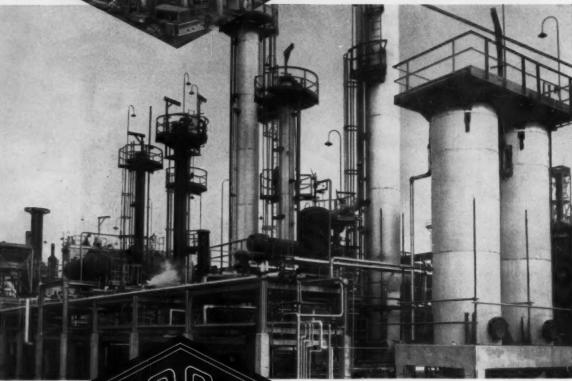


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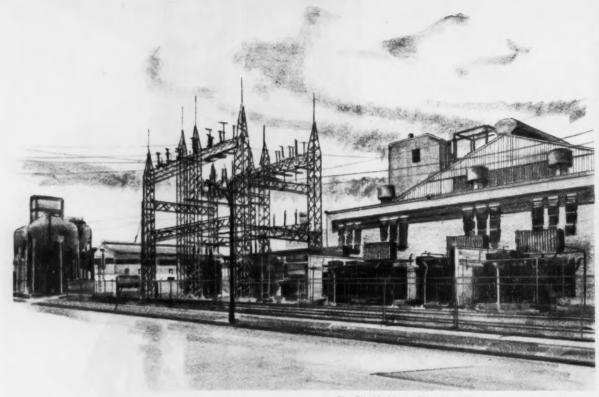
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LETTERS

Started at Sixteen

To the Editor: Someone is wrong, or they had no child labor laws in Toledo in '23. In your article (March 18, p. 50) you report Clyde Shamblen to be 53 years old and active in unions since '23—Or did unions have water boys in those days instead of coffee breaks?

F. A. NEWBERG Enco Chemical Corp. New York

The biography of Mr. Shamblen supplied by OCAW says that he worked several years (1923-33) for the C. & O., where he was active in Maintenance of Way Employees and the Brotherhood of Railway Trainmen. He started work at 16, but not in Toledo.—ED.

Clear on Depreciation

To the Editor: We would like to express our admiration for the report on depreciation (March 25, p. 111). It is the clearest and most comprehensive exposition of the problem that we have seen and, in our opinion, should be given the widest possible circulation.

After a decade of apathy, industry is awakening to the gravity of this problem, and I'm sure your article will receive an enthusiastic reception.

RICHARD S. RIMANOCZ
Editorial Director
The American Economic Founda-

New York

To THE EDITOR: I think your write-up on depreciation represents excellent coverage of the subject and I trust will have an impact on the thinking of people not only in the chemical industry but also in many other industries and companies.

WILLIAM T. HOGAN, S. J. Fordham University New York

Dried-Grains Problem

To the Editor: With interest, we have been following your reports on the molasses vs. corn problem at Publicker Industries, Inc. (March 11, p. 90).

We would like to bring to your attention a problem that would affect every distilling firm in this country drying their by-products and marketing distillers' dried grains. Thirty million bushels of corn would produce approximately 270,000 tons of distillers' dried grains, an amount that is more than the annual production in the whole country now, and you can well imagine what this would also do to the feed industry as a whole.

FRANK KRAUS
Vice-President
Barton Distilling Co.
Bardstown, Ky.

MEETINGS

Sugar Industry Technicians, Inc., 20th annual meeting, Sheraton-Atlantic Hotel, New York, May 7-9.

Institute of Food Technologists, 21st annual convention, Hotel Statler Hilton, New York, May 7-11.

Technical Assn. of the Pulp and Paper Industry (TAPPI), annual coating conference, Statler Hilton Hotel, Buffalo, N.Y., May 8-10.

Conference, "Water Pollution in the Great Lakes Area"; sponsor: DePaul University; Pick-Congress Hotel, Chicago, May 15-16.

Assn. of American Battery Manufacturers, Inc., spring meeting, Roosevelt Hotel, New Orleans, May 15-17.

Chemical Market Research Assn., 21st annual meeting, Plaza Hotel, New York, May 17-18.

Metallurgical Society of American Institute of Mining, Metallurgical and Petroleum Engineers, first conference on "Management of Materials Research," Arden House, Harriman, N.Y., May 17-19.

Glass Container Manufacturers Institute, Inc., spring meeting, The Greenbrier, White Sulphur Springs, W. Va., May 23-25.

Pacific Northwest Society for Paint Technology, annual symposium, Georgia Hotel, Vancouver, B.C., Can., May 26-27.

Air Pollution Control Assn., 54th annual meeting, Hotel Commodore, New York, June 11-15.

CW welcomes expressions of opinion from readers. The only requirements: that they be pertinent, as brief as possible.

Address all correspondence to: H. C. E. Johnson, Chemical Week, 330 W. 42nd St., New York 36, N.Y.

This is the new shape of steel pails



This is the new U.S. Steel nesting pail... the Taper-ite



The U.S. Steel Taperite is the finest pail to ever hit the packaging field. Look at its design. Notice there is a top swedge in addition to a bead. This makes the Taperite pail stronger. And the lower bead is the only contact point when the pails are nested. The single side seam is welded and each pail is air tested for tightness.

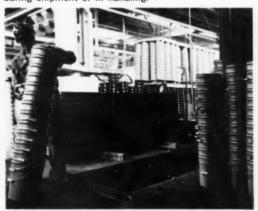
Notice the embossed design of the Taperite cover. When filled pails are stacked and rolled — the embossment makes a tight and secure fit. And the cover is standard size, so regular closing tools can be used.

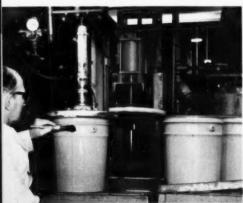
Taperite pails offer real economy too - they save storage space and expensive handling time. What could be more practical?
For further information and samples of the Taperite pail, wire, write or call your nearest U.S. Steel Products Division representative.



Saves 66% storage space: Taperite's nesting feature saves you 2/3 the space needed for conventional pails.

Below—Cuts handling costs: Unloading and handling time are cut down because more pails can be handled at the same time. Cuts the hazard of stacks falling during shipment or in handling.





Quality tested: Each Taperite pail is airtested for tightness and visually inspected before we ship it. Taperite pails are also subjected to drop tests, hydrostatic tests and vacuum tests on a periodic basis.

Right—Easy stacking: The double seamed bottom fits the special debossment in the cover permitting easy stacking and handling when the pails are filled.





Regular equipment can be used: The top of the Taperite pail is the same size as a standard pail so Taperite's lug covers can be closed with regular closing equipment.

Taper-ite Pail Specifications

These specifications conform with ICC requirements

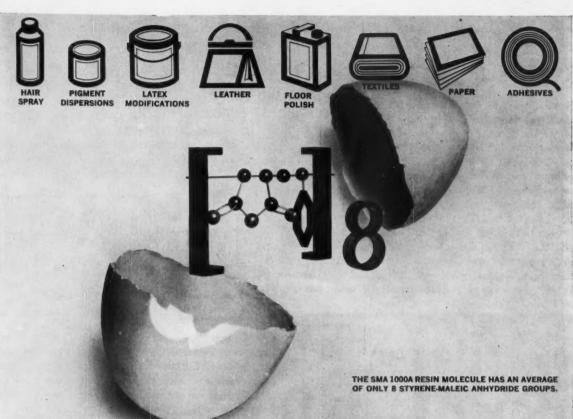
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DA ET	13 7/8	16 5/16	17 17/32		
- Par Cavery	13 31/32	16 13/32	17 5/8		
A Change	12 1/16	12 1/16	12 1/16		
Top : W	11 1/4	11 1/4	11 1/4		
Plant Locations	10 7/16	10 7/16	10 7/16		

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Phone: Lakehurst 2-5511
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P. O. Box 530
Phone: Normandy 3-8000
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14700 Harvard Avenue
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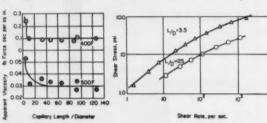
Polychemicals Department, 529 Fifth Avenue, New York 17, New York. TB&C also produces: Butadiene, Butene-1, Butene-2, Mixed Butylenes, Propylene, Alkylate, Avgas.

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NEWTON AND THE NON-CONFORMIST FLUIDS

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viscous fluids behave in a non-Newtonian manner. In polymer melts, for example, viscosity may vary with pressure and flow rate. These properties must be measured — with accuracy — in order that their behavior may be predicted in advance. Knowledge of flow behavior assists the researcher in studying molecular structure . . . helps the engineer in designing more efficient process equipment. Which is why we're using this space to tell you about the new Instron Capillary Rheometer, a valuable and versatile new tool for studying the behavior of polymer melts and other non-Newtonian fluids.

Newton's classical hypothesis, stated

above, provides a basis for the study

of viscous flow. However, many



Capillary Rheometer Mounted On Floor Model Instron

Designed for use in INSTRON Tester

The new Instron Capillary Rheometer (Type MCR) consists of an extrusion assembly mounted on an Instron Universal Tester. Temperature controls are contained in a separate cabinet. A sample of polymer or other non-Newtonian fluid is forced out through a

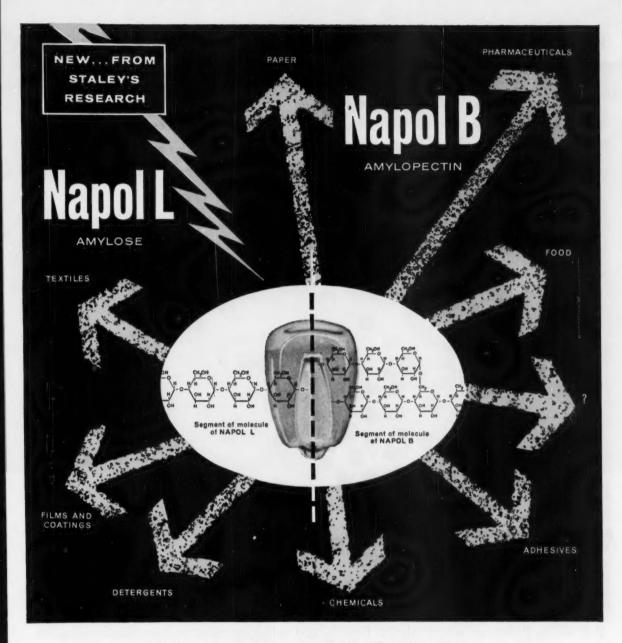




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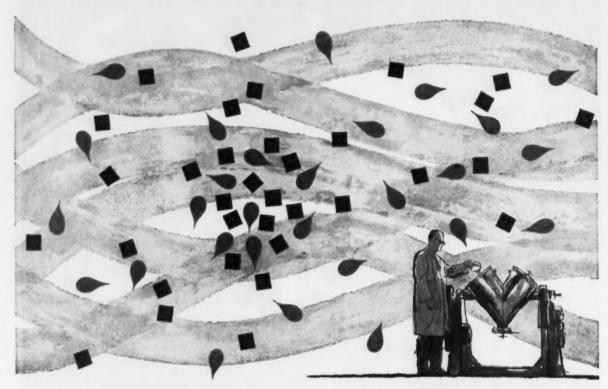
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Your Invitation to Research ... Tetra (dimethylamino) diboron

TYPICAL REACTIONS

HYDROLYSIS

B₂[N(CH₃)₂]₄ + 4 H₂0 + 4HC1 — Tetra(dimethylamino)diboron ► B₂(OH)₄ + 4 (CH₃)₂NH-HC1 Tetrahydroxydiboron

ALCOHOLYSIS

TRANSAMINATION with an Allphatic Secondary Amine

$$\begin{split} B_2[N(CH_3)_2]_4 + 4 &\underbrace{(n\cdot C_4H_9)_2NH} \longrightarrow B_2[N(n\cdot C_4H_9)_2]_4 + 4 &\underbrace{(CH_3)_2NH} \\ & - \text{Tetra}(di-\underline{n\cdot}\text{butylamino})diboron \end{split}$$

TRANSAMINATION with an Aromatic Primary Amine

 $B_2[N(CH_3)_2]_4 + 4 C_0H_9NH_2 \longrightarrow B_2(NH_2)$

B₂(NHC₆H₅)₄ + 4 (CH₃)₂NH Tetra(anilino)diboron

REDUCTION

B2[N(CH3)2]4 + 2 Ag+ 6 H20 -> 2 H3BO3 + 2 Ag+ 4 (CH3)2NH + 2 N+

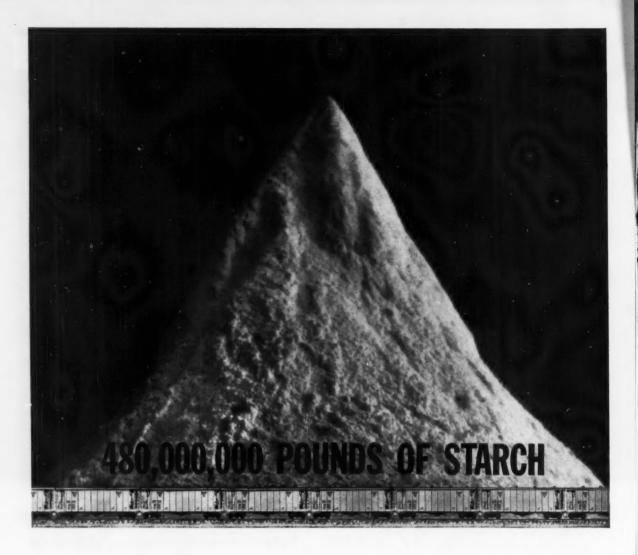
Here is the FIRST diboron compound ever offered to industry. More than two years of intensive research went into its development. Now you can have a one-ounce sample of Tetra (dimethylamino) diboron without charge—just for the asking!—so that you may join us in exploring the challenging new field of boron-boron chemistry.

Consider the column at the left. The reactions listed are but a few of the many types which are possible with this new boron-boron compound.

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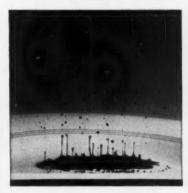
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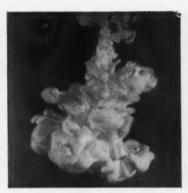
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Petronates®: a full line of oil- and water-soluble surfactants whose properties as wetting, dispersing and emulsifying agents and rust inhibitors give them wide use as lube oil, fuel oil and gasoline additives, and in manufacturing such products as drilling muds, dry cleaning soaps, cutting oils, metal degreasers, rust preventives and textile and leather processing oils. Available as sodium. calcium, barium, magnesium and ashless salts. Other Surfactants: Oxidized hydrocarbons for use as rust preventives and emulsifiers.



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Sulframins®: basic surface-active agents for the manufacture of detergents and cleaning compounds for industrial, institutional and domestic use...and for a variety of other industrial applications such as air-entraining agents for concrete and for gypsum wallboard. Other Surfactants: Hydrotropes xylene and toluene sulfonates for use as solubilizing and coupling agents: Ultrapoles®-conventional alkanolamine condensates and superamides; Neopones®-nonionics for various detergent tasks.



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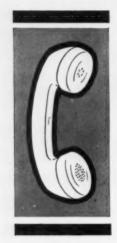
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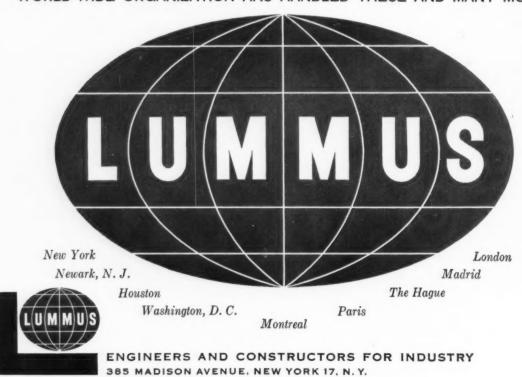
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wenty million teen-agers with more than 9 billion dollars in their pockets are wanting, buying and using many kinds of products. They have a world of their own, these teen-agers. They have their own clothing styles, their own hair styles.

Will yours be the firm that brings them their own toiletries?

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Remember the Mother would hoard fats and oils all winter for spring soap making.

black kettle and She might have made her own lye, too, by leaching wood ashes. These were boiled in a big, black wash kettle, then ladled out to set into yellow slabs of lye soap.

Now, these soap making time ladled out to set into yellow states of tye soap. I now, these wash kettles demand a premium price as "antique planters,"

but soap making has progressed to stainless steel and specialized technologies. Jefferson contributes with Caustic Soda, most often used as the alkali in common soap. Ethanolamines, SURFONIC® Surface-Active Agents, Morpholine and Polyethylene Glycols help provide the wide range of special characteristics required in today's soaps, detergents and waxes.

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Business

Newsletter

CHEMICAL WEEK May 6, 1961 Shareholders okay merger of Industrial Rayon and Midland-Ross. At separate meetings late last week stockholders of both companies put their stamp of approval on the deal that will convert each of 1,851,225 common shares of Industrial Rayon to two-fifths of a share of Midland-Ross common. In the process, IR will be absorbed, become an M-R division, although 52% of the combined company will be owned by Industrial stockholders (see p. 42).

There was opposition to the marriage. The United Stockholders Committee of Industrial Rayon, the same group that blocked merger with Texas Butadiene last year, also opposed the new deal. It charged that the merger was "ill-timed," that IR management could have gotten better terms. Committee representatives pointed out that while IR was in the black in the first quarter of '61, Midland-Ross earnings were off.

Meanwhile, M-R shareholders learned how badly earnings fell. Company officials disclosed that first-quarter '61 earnings were only \$606,734, or 61¢ a common share. Figures for the comparable period last year were \$1,254,221, or \$1.56 a share.

Conversion of the Industrial Rayon stock will bring the number of M-R common shares outstanding to 1,422,527.

The U.S. gets another beryllium company with formation of Beryllium Metals & Chemicals. Parents of the jointly owned venture are Lithium Corp. (majority holdings) and The Alloyd Corp. of Cambridge, Mass. The new company will engage in beryllium research and in the purification and production of beryllium metals and chemicals. No cost or capacity details are available yet, but Lithium Corp. President Harry Feltenstein tells CW the operation will be "fairly substantial." A plant will be built near his company's chemicals operation at Bessemer City, N.C., and should be producing by late summer '62.

Beryllium metal capacity will be expanded at the Brush Beryllium integrated plant in Elmore, O. Additional furnace capacity, chemical process equipment and support units will more than double the company's output, upping it from 12,000 lbs./month to more than 30,000 lbs.

The \$6-million expansion was started last year, is now nearing completion, says Brush Vice-President N. W. Bass. Savings on larger-volume production are being passed on to consumers (see Market Newsletter, p. 108).

And Standard Beryllium (New York), in a move to help finance its construction program near its beryl deposits in Brazil, this week declared a 5% stock dividend rather than cash. Reason: to preserve its dollar position to build one or two concentrating mills at Boa Vista. Standard is

Business

Newsletter

(Continued)

said to be aiming at use of the Van Dornick flotation process controlled by Beryllium Resources and inventor Edward Van Dornick.

U.S. polyethylene capacity continues to inflate. Word was out last week, for example, that Du Pont would up its total polyethylene capacity to nearly 400 million lbs./year. A new high-pressure unit will go up at its Sabine River Works near Orange, Tex.; operation of the estimated 50-60-million-lbs./year plant is slated for late '62. (Du Pont recently sold its billionth pound of conventional polyethylene produced at the present Orange installation.)

There's nothing official on this yet, but chances are you'll soon be hearing about a Du Pont commercial-size polypropylene project. Pilot planting is at an advanced stage.

Here are latest details on the Rexall-El Paso Natural Gas olefins and polyolefins venture at Odessa, Tex. When the complex is completed late in '64 or '65, it will have cost about \$80 million. There will be production units for ethylene, propylene, regular and linear polyethylene and polypropylene.

Initial timetable calls for early '62 startup of a 120-million-lbs./-year conventional polyethylene plant designed and constructed by Fluor and operated by Rexall. This in addition to a 180-million-lbs./year olefins plant that will be operated by El Paso to furnish needed ethylene.

Process design for the latter unit is by Universal Oil Products and mechanical design and construction will be handled by Fish Engineering.

Ground-breaking ceremonies last week marked the start of construction of Armour Agricultural Chemical's six-plant nitrogen fertilizer complex at Cherokee, Ala. When the project is completed early next year (as part of a \$60-million expansion) Armour's investment in chemicals will exceed that for the company's Chicago meat packing business. Tons/day capacity of the six plants: ammonia, 360; urea, 50; nitrogen solutions, 250; nitric acid, 300; ammonium nitrate, 250; ammonium phosphate, 500. The company is also building a phosphate plant at Fort Mead, Fla.

The town of Cherokee will build the new complex for lease to the Armour subsidiary under a \$25-million bond issue.

A knockout punch for maleic anhydride (MH-30) as a growth regulator for tobacco plants. That's the way cigarette companies view a new U.S. Dept. of Agriculture report on the controversial farm chemical's effect on tobacco leaf quality (CW Business Newsletter, Aug. 27, '60). But MH-30 producer U.S. Rubber's Naugatuck Chemical Division, claims USDA missed its mark. Naugatuck insists that "the major point emerging from the study is that MH-30 does not lower tobacco quality when it is properly applied."



Among the important factors in Shell Chemical's decision to make polystyrene were its extensive background in polymers and its raw material position. Two other Shell thermoplastics followed quickly—polypropylene and polyethylene.

BULLETIN:

On May 3, 1960, a remarkable thermoplastics decision was made by Shell Chemical

Read about this Shell decision. And how you can start benefiting today from a major new source of polystyrene, polypropylene and polyethylene that resulted from it.

O^N MAY 3, 1960, Shell Chemical, a company long basic in styrene monomer and SBR rubber, decided to combine the two in full commercial production of Shell high impact polystyrene. Why was this remarkable?

A revealing fact on polystyrene

The condition of the polystyrene market was not attractive. There was oversupply from some of America's finest companies. The field was mature and Shell was starting late.

One revealing fact offset this situation. Shell, with its excellent background in polymer chemistry—as exemplified by Shell Isoprene Rubber, the industry's first commercially produced synthetic/natural rubber—could make positive contributions to the thermoplastics field in the form of new products. But Shell would be severely handicapped without a thorough understanding of how the thermoplastics market works and what it wants.

Result? Shell's decision to go full speed ahead with high quality general purpose, medium and high impact Shell polystyrenes, plus a rapidly expanding technical sales force.

80 million pounds of polypropylene

Two other thermoplastic developments followed quickly.

One, Shell's announcement in October, 1960, for an 80 million pounds a year polypropylene plant with customer service and research facilities to be built near Woodbury, N. J. Two, an arrangement by which Shell will resell limited quantities of polypropylene until this plant comes on stream.

Custom-made polyethylene

And this, in turn, led to a third important thermoplastic.

In order to round out a complete line of thermoplastics, Shell Chemical, in January, 1961, made arrangements to supply the industry with the highest quality custom-made polyethylenes.

How to start benefiting

Thus, within 8 months, Shell became an important factor in three plastics: Shell polystyrene, Shell polypropylene and Shell polyethylene.

The next 8 months should be even more important. Shell will be going full speed ahead searching for new polymers you want.

Now is the time to let Shell's technical representative know your needs. Tell him about them on his next visit or write Shell Chemical directly at:

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Plastics and Resins Division

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36 CHEMICAL WEEK May 6, 1961

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A SKILLED HAND IN CHEMISTRY . . . AT WORK FOR YOU



Trustbusters Kennedy, Dixon (upper right) and Loevinger: War against 'economic racketeering'.

Antitrusters Eye Chemical Prices

Philadelphia's strike of taxi drivers did little to improve the tempers of chemical executives and their lawyers gathered in that city to face a federal grand jury investigating price fixing.

The U.S. Dept. of Justice's current probes are directed against makers of chlorine, caustic soda, and soda ash (CW Business Newsletter, April 1). Setting off the probes was a series of identical bids submitted on city, state and federal contracts for these commodities. A good deal of the grand jury's preliminary work has already been done as a result of state antitrust suits concerning these chemical prices. (New York, Texas and California started such actions.)

Observers feel that the government is looking for a quick follow-up to the electrical cases, to plant more firmly in the public mind the stern lessons taught there: that price-fixing is not just a legal technicality but is, as the Justice Dept.'s antitrust chief put it, "economic racketeering which gains no respectability by virtue of the fact that the loot is secured by stealth rather than by force. Those apprehended in such acts are, and will be treated as, criminals. . . ." As the electrical cases showed, stiff fines and jail sentences face the of-

The Price Is Wrong: Grand juries sitting in about 45 cities are now con-

sidering antitrust cases, many of them involving price-fixing. The Dept. of Justice and Federal Trade Commission are scanning industry, looking for signs of collusion to supply to the grand juries. Considered a key (and readily available) tip-off: identical bids submitted by several firms to government purchasers. An order went out last week from President Kennedy to all Federal agencies to report to the Dept. of Justice all such bids on contracts of more than \$10,000.

Identical prices, per se, are not illegal. For that matter, despite much noise it has made to the contrary, the government does not even consider them a sure sign of collusion. But they are among the things the Dept. of Justice scrutinizes, along with price-increase announcements in trade magazines, and the like, in an effort to detect illegal signals. One Justice staffer states two basic questions: "If there is genuine competition in this industry, how should it be reflected in prices?" And its counterpart: "If there is collusion, how should it be reflected in prices?"

Through experience, Justice feels that isolated instances of identical prices don't mean anything. When such bidding—particularly on raw materials—extends over a period of months or years, the antitrusters begin to watch for a pattern that indicates collusion. They feel that if the situation is reasonably competitive, there should be some price fluctuation over a period of time, even if everybody's price fluctuates the same.

Hospitality Suites: Moving from suspicion to conviction is difficult. The government must prove that the prices were arrived at by conspiracy. The government was able to do this in the electrical cases only because some people involved described what went on in the hotel rooms. Current loud talk about jail sentences will help smoke out more such witnesses—they will be offered immunity.

Talk of jail will also help in a primary Justice aim: discouraging price-fixing through scary publicity. The department doesn't have the manpower to follow through on all of its suspicions, or even to wade through the mass of information on identical bids it will get as a result of Kennedy's order. Therefore, heavy reliance will be placed on publicity from cases won and such tactics as shaming industry by publishing occasional lists of identical bids (probably only in government reports). Some dailies are already making stories of local identical bids, even where they go back many years.

The Antitrusters: These are the key men in the government's drive against price fixing:

- Robert F. Kennedy, Attorney General. The President's brother spearheads the publicity drive with many stern statements about antitrust enforcement, will probably tend to leave details to assistants. Kennedy appears to have an almost puritanical attitude toward wrong-doing, and from the way he's been talking, price fixing conspiracies are among the top evils on his list, along with organized crime and racketeering.
- Lee Loevinger, Assistant Attorney General in charge of the antitrust division. Loevinger is a specialist in antitrust law and has written extensively on the subject. He thinks private parties should bring their own antitrust suits when they feel they are aggrieved. He believes this would give more meaning to the triple-damage

clauses of the statutes. The antitrust bar respects him highly as a sound thinker.

- Paul Rand Dixon, chairman of the Federal Trade Commission. He's been in Washington since the late '30s, most of the time as an FTC attorney. He spent several years as chief counsel of Sen. Estes Kefauver's antitrust and monopoly subcommittee, as a result of his hostile attitude is mistrusted by many businessmen.
- Is There Price-Fixing? Chemical sales executives around the country tell CHEMICAL WEEK that they suspect occasional cases of price-fixing; some report having been approached at one time or another in years past. One man, now on the West Coast, says he sees much less of it there than he has seen in the rest of the country.

Many say that if there was collusion it was probably not successful. They point out that the people who get involved in such things really don't trust each other, are likely to renege on an agreement and undercut the set price. It's difficult to go over a posted list price, but easy to go under.

One sales executive felt that in any case, few groups have been able to set up agreements that would enable them to raise prices. The best they could do, he felt, was to hold the line against possible disastrous price wars (such as Canadian makers of industrial gases are now experiencing). Other price-fixing schemes, he says, have been organized by small suppliers as a defense against the immense economic power of large purchasers such as big mail-order houses-or the government. (The same man pointed out that many reports of shenanigans came from salesmen, who tend to blame their misfortunes on thingsreal or imagined-beyond their control.)

Summing up an attitude reassuringly common among chemical sales people, one executive (talking about the jailed electrical equipment men) said, "These people knew they were blatantly breaking the law. And this is bad personal and corporate citizenship. If a company or an executive doesn't like a situation involving business, he should fight it, by pressuring Congress and other political bodies to change the laws.

"But in this particular case, I even agree with the law."

Pending Chemical Price Cases

Antifreeze: Union Carbide is charged with conspiring with marketers to fix the resale price of Prestone.

Melamine: American Cyanamid is charged with conspiring with six other concerns to, among other things, regulate prices.

Laundry Bleach: Thompson-Hayward Chemical Co. (Kansas City) is charged with illegal price differentials in different markets.

Carbon Dioxide: General Dynamics (Liquid Carbonic), Air Reduction, Olin Mathieson, and Chemetron are charged with violating terms of a '52 price-fixing judgment.

Tranquilizers: Carter Products and American Home Products are charged with monopolizing sale and fixing prices of meprobamate tranquilizers.

Antibiotics: Pfizer, American Cyanamid, Bristol-Myers, Bristol Laboratories, Olin Mathieson, and Upjohn are charged with restraining trade and fixing prices.





Cyanamid's Kilpstein, Martin: Moving up into top triumvirate.

New Chiefs for Cyanamid

American Cyanamid this week has a new command triumvirate, with bacteriologist and marketing specialist Wilbur G. (Weed) Malcolm, 58, moving up from president to chairman; Kenneth H. Klipstein, 61, advancing from executive vice-president for operations to president; and George R. Martin, 63, previously executive vice-president for services, becoming chairman of an enlarged executive committee.

Despite the new titles, however, functions will change only slightly. Malcolm will continue to serve as chief executive officer; Klipstein will still have administrative responsibility for all operating divisions; and Martin will continue to have administrative responsibility for the treasury, legal, and other service divisions. Malcolm—who will work particularly on corporate policy and planning—is the third chairman since Cyanamid established that office in 1957; Klipstein becomes the sixth president in the company's 54-year history.

Triggering these promotions: another shift in the long series of officer-director relationships between Cyanamid and Duke Power Co., whose founder—tobacco king James B. Duke—had been a principal backer of Cyanamid. In this latest shift, Thomas L. Perkins resigned as chairman of Cyanamid's board to accept election as Duke Power chairman. He'll remain

as a member of Cyanamid's board. Perkins's father had served as Duke's counsel and was instrumental in choosing the late William B. Bell as president of Cyanamid when founder Frank S. Washburn died in '22.

The Duke aid in Cyanamid's growth started back in '07 with financial support for the Niagara Falls calcium cyanamide project (with which Washburn started his company). It included assistance in Cyanamid's entry into Florida phosphate mining and in Cyanamid's 1930 acquisition of Chemical Construction Corp. (which was sold in '56 to Electric Bond and Share Co.).

Malcolm, who came up through the Lederle Laboratories division, became Cyanamid president in '57.

Klipstein came to Cyanamid in '33 when it acquired E. C. Klipstein & Co., of which he was treasurer. He holds an A.B. in economics and an M.A. in chemistry from Princeton, and from '54 to '57 served as general manager of Cyanamid's research division.

Martin, who earned a law degree and Phi Beta Kappa honors at the University of Virginia, was assistant city attorney of Norfolk, Va., in 1927 when he was brought to New York to organize Cvanamid's legal department. He headed that department for the next 23 years, and since then has served as vice-president and director.

Who's for TEL?

By the end of June there should be definite word as to what new entry, if any, is going to do what, if anything, in tetraethyl lead (TEL) and tetramethyl lead (TML). Like two hesitant divers at the edge of a swimming pool, Nalco Chemical Co. and Stepan Chemical Co. are nervously watching each other to see which will plunge first.

Early this year Stepan stated it would enter the highly profitable field to challenge entrenched giants Ethyl and Du Pont (CW, Feb. 4, p. 31). A month later Stepan got word that Nalco was working on a new process, began reappraising its plans (CW Business Newsletter, March 11).

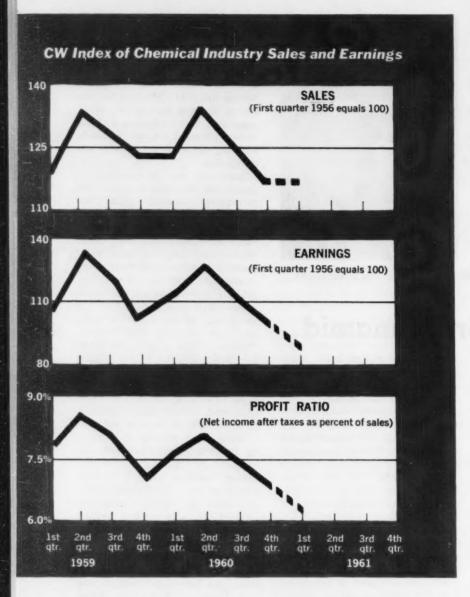
Although Nalco says it will "naturally re-evaluate" its plans if Stepan reverses itself again and decides to go ahead, odds are that Nalco will be the next new producer after Houston Chemical Corp. comes onstream in July. Nalco now sells to and services the oil industry extensively and thus has excellent contacts (the industry would be new for Stepan), and has a company-developed process which, it feels, will produce at a low cost.

Nalco won't describe its process, but David Braithwaite, executive vice president and man behind the new venture, confirms that it is an electrolytic process, "substantially different" from the Ziegler process announced two years ago that involves electrolysis of a sodium aluminum alkyl-ethylene complex (CW, June 13, '59, p. 37). Asked if Alcoa (the Alcoa Foundation owns about 20% of Nalco stock, and Nalco's president of one year, Thomas C. Jones, is an Alcoa alumnus) might be in the supply picture, Braithwaite said, "That's something I'd rather not talk about.'

Karl Ziegler, when queried by CHEMICAL WEEK in Mulheim, Germany, confirm that Nalco isn't using his process, but indicated he is negotiating with another company.

Probably Nalco will have a TEL-TML (mainly TML) plant in operation at Houston by July, '62. Other alkyl lead compounds using the same process will be made there later.

Meanwhile, other companies are looking at TEL-TML. Although it denies the rumor (CW, March 25, p. 7), Callery Chemical is still considered a good bet by the industry.



Profits Dip, Spirits Rise

Although the chemical industry's first-quarter earnings were at their lowest point in nearly three years, company executives are brimming with optimism this week. The reason, of course, is that the business upturn that started late in February is still gathering momentum; and as a specialist in chemical stocks reminded Wall Street last week, a recovery period usually has "a pronounced effect on chemical earnings."

Senior Vice-President Jack W. Castino of the Chemical Fund pointed out that chemical plant economics are such that increasing the operating rate from 70% to 90% of capacity involves little additional cost but exerts powerful "leverage" on income. And he noted that any such effect this year is likely to be strengthened by a recent firming up in chemical prices.

So while most chemical company presidents have had to report that first-quarter earnings were 20-30% lower than in the corresponding period of 1960 (chart, above), they are also telling stockholders that business perked up considerably in March—and that April sales showed further

improvement. They agree with most economists that the outlook is for a moderate uptrend through the rest of this year and into '62; but are generally impatient to make fuller use of their increased plant capacities.

Temporary Overcapacity: Union Carbide President Birny Mason, for example, laments that while his company now has production facilities capable of producing \$2 billion worth of sales a year, operations during 1960 as a whole were at only about 75% of that capacity.

But Mason sees this situation as a short-range problem that can't be avoided if the industry is committed to growth policies. "We at Union Carbide must plan for future growth." Mason declares. "Since we must build our facilities ahead of time, this will inevitably lead to temporary periods of overcapacity when a downturn occurs."

Mason calls the cost-price squeeze "more pronounced than we have experienced heretofore." Cited as factors: (1) continuing increases in wage and salary rates that are not offset by higher prices or increased productivity; (2) a 44% increase in cost of equipment and (3) a 37% increase in rail and truck rates during the past 10 years. In contrast, he adds, the price level for all Carbide products combined is actually slightly lower than it was 12 years ago.

Boost from Farmers: One particularly booming segment of the chemical business right now is that of fertilizers and other farm chemicals. Producers of basic fertilizer chemicals—such as International Minerals and Virginia-Carolina—report more than a usual thrust in their late-winter upturns this year (table, p. 41).

But there's much more to the current recovery than the rising demands of farmers. Allied Chemical—a leading producer of nitrogen fertilizer materials—acknowledges that its March results reflect in part some normal seasonal gains, especially in agricultural nitrogen. But Chairman Kerby H. Fisk stresses that there was also "marked improvement in most areas of the company's business."

Aside from the companies that are heavy in ag chemicals, at least three other chemical companies managed to buck the trend toward sharply decreased earnings. Atlas Powder lifted its first-quarter net income nearly 6%

How They Fared in the First Quarter

	SALES		EARNINGS		PROFIT	
(All dollar figures in millions)	1st qtr. 1961	Change from 1st qtr. '60	1st qtr. 1961	Change from 1st atr. '60	1st qtr. 1961	1st qtr
		135 qu. 00	1701	y oo	2701	-
CHEMICALS AND FERTI		De 7.40/	0.0	Down 21 20/	E 00/	7 00/
Air Reduction Allied Chemical	48.5 168.6	Down 7.4% Down 8.5%	2.8 9.5	Down 31.3% Down 29.8%	5.8% 5.6%	7.8% 7.3%
American Agric'l. Chemical(1)		_	1.23	Up 98.3%	_	_
American Cyanamid	148.2	Down 7.2%	12.2	Down 26.4%	8.2%	10.4%
American Potash & Chemical Atlas Powder	11.2 16.8	Down 15.6%	1.03 0.70	Down 19.8%	9.2%	9.7%
Catalin Corp.	4.65	Up 1.5% Down 12.0%	0.05	Up 5.7%	4.2% 1.0%	_
elanese Corp.(3)	62	Down 7.0%	3.5(4)	Down 27.2%	5.7%	7.39
Commercial Solvents Diamond Alkali	15.1	Down 6.9%	1.24	Up 9.0%	8.2%	7.09
Dow Chemical (5)	31.3 182.5	Down 5.1% Down 3.4%	2.1 12.1	Down 26.9% Down 26.6%	6.7%	8.79 8.79
Du Pont(3)	512	Down 4.3%	51 (4)	Down 22.0%	10.0%	12.29
eneral Aniline & Film	38.8	Down 1.5%	1.34	Down 23.1%	3.4%	4.49
dercules Powder deyden Newport	86.0 14.4	Up 8.0% Down 3.9%	5.6 0.71	Up 0.4%	6.5% 5.0%	7.09
Hooker Chemical (5)	34.7	Down 3.9% Down 4.2%	2.6	Down 18.8% Down 12.5%	7.5%	7.09 5.99 8.39
Coppers Co.	58.8	Down 12.5%	0.92	Down 47.8%		2.69
nternational Min. & Chemical	35.1	Up 1.5%	2.4	Down 0.5%	1.6% 6.7%	6.99
Mallinckrodt Chemical Michigan Chemical	8.5 2.0	Down 11.4% Up 9.8%	0.19 -0.03	Down 40.1%	2.2%	3.3
Monsanto Chemical	219.4	Down 3.1%		Down 18.1%	7.1%	8.40
Nalco Chemical	12.5	Down 0.6%	1.11	Down 2.8%	7.1% 8.9%	8.49 9.19 4.49 5.39
Nopco Chemical	10.7	Up 5.7%	0.4(10)	Down 5.3%	3.7%	4.49
Olin Mathieson Chemical Pennsalt Chemicals	160.0 22.0	Down 1.9%	5.1	Down 40.3%	3.2%	5.8
Pennsalt Chemicals Pittsburgh Coke & Chemical	22.0 10.3	Up 0.2% Down 35.4%	1.21 -0.43	Down 4.3%	5.5%	4.1
Rohm & Haas	51.8	Down 7.9%	4.0	Down 32.1%	7.7%	10.5
Spencer Chemical	19.6	Up 26.1%	1.6	Up 79.2%	8.1%	5.79
Stauffer Chemical Jnion Carbide	56.0 364.3	Up 5.2% Down 7.8%	3.8 33.7	Down 25.0% Down 19.9%	6.8% 9.3%	9.50
/irginia-Carolina Chemical	24.9	Up 14.0%	0.73	Up113.7%	2.9%	1.69
Witco Chemical	24.4	Up 2.7%	0.6	Down 19.3%	2.4%	1.69 3.19 3.59
Wyandotte Chemicals	22.1	Down 0.6%	0.49	Down 36.0%	2.2%	3.5
PHARMACEUTICALS:						
Abbott Laboratories	34.0	Down 6.2%	3.5	Down 21.9%	10.3%	12.49
Lilly, Eli(3)	48.4	Down 1.6%	5.6	Down 17.6%	11.6%	13.8
Merck & Co. Miles Laboratories	55.0 23.2	Down 1.4% Up 11.8%	6.2 1.13	Down 17.0% Up 30.8%	11.2% 4.9%	4.2
Norwich Pharmacal	11.1	Up 3.5%	1.6	Up 17.5%	14.1%	13.3° 4.2° 12.4°
Parke, Davis	47.5	Down 11.0%	5.8	Down 39.8%	12.1%	17.99
Pfizer, Chas. Schering Corp.	72.2 18.8	Up 5.0% Down 15.1%	7.5 1.75	Up 5.7%	10.4% 9.3%	10.39
Upjohn Co.	39.4	Down 0.5%	5.4	Down 35.3% Down 7.3%	13.8%	12.2° 14.8°
Warner-Lambert	48.2	Down 4.5%	3.6	Down 8.9%	7.5%	7.9
OTHER CPI COMPANIES	S :					
American Enka ⁽⁶⁾	22.5	Down 4.5%	0.6	Up 17.7%	2.7%	2.29
Eastman Kodak ⁽⁶⁾	193.9	Down 0.8%	21.8	Down 9.8%	11.3%	12.49
Foote Mineral Freeport Sulphur(1)	3.4	Down 34.2%	0.02 2.7	Down 90.9% Down 14.0%	0.7%	4.89
ndustrial Rayon	10.0	Down 22.7%	0.32	(7)	3.2%	_
nterchemical Corp.	31.5	Down 2.3%	0.82	Down 45.5%	3.2% 2.6%	4.79
Kaiser Aluminum & Chemical Metal & Thermit Corp.	96.3 9.7	Down 13.3%	3.5	Down 51.5%	3.7%	6.69
National Distillers and Chem.	9.7	Down 3.1% Up 1.8%	0.26 4.8	Down 6.4% Down 20.3%	2.6%	2.79
National Lead	114.6	Down 13.6%	9.5	Down 21.3%	3.5% 8.3%	4.50 9.10 5.70 7.70
National Starch and Chemical	15.0	Up 11.6%	0.76	Down 0.1%	5.1%	5.7
Pittsburgh Plate Glass	129.0	Down 18.5%	3.6	Down 70.5%	2.8%	7.7
Rayonier Inc. Texas Gulf Sulphur	30.7 13.4	Down 10.1% Up 2.2%	1.6 2.7	Down 41.2% Up 1.2%	5.1% 20.5%	7.7
Thiokol Chemical	41.9	Down 0.1%	1.04	Up 27.7%	2.5%	1.9
U.S. Rubber(3)	220	Down 13.4%	5.2	Down 47.5%	2.5% 2.4%	7.70 20.70 1.90 3.90
Vitro Corp. (8)	11.8	-	0.64	_	5.4%	_

⁽¹⁾ Sales data not reported. (2) Net loss of \$16,775 in first quarter '60. (3) Preliminary estimates. (4) Net operating income estimated by CW. (5) For three months ended Feb. 28. (6) For 12 weeks ended March 19. (7) Net loss of \$504,134 in first quarter '60. (8) Quarterly data not previously reported. (9) Net loss of \$157,000 in first quarter '60. (10) Excluding capital gains.

on sales only slightly higher than one year ago. Commercial Solvents scored a 9% earnings gain, thus continuing its improved performance since it spun off certain less profitable operations last year (CW, March 18, p. 24). And Hercules' net income inched up fractionally, although an increased number of shares outstanding caused a drop in per-share earnings.

A sprinkling of other CPI firms notably Miles, Thiokol, American Enka—also boosted their earnings.

As of this week, there's little doubt in the industry that second-quarter sales and earnings will be up smartly from the past winter's lows. But only a few companies expect to top their showings in last year's second-quarter spurt.

New Line in Argentina?

Foreign investors in Argentina are uneasy over the shake-up in President Arturo Frondizi's government, which resulted last week in the resignation of Economics Minister Alvaro Alsogaray, along with other officials.

With Alsogaray goes the sevenman economic team that has helped him push the economic stabilization plan. With its tough austerity measures, and the government's accompanying favorable attitude toward private investment, the program has stirred up a lot of political opposition, but also attracted large numbers of U.S. investors.

President Frondizi's Radical Intransigent party has been losing the leftwing support it needs for a majority in upcoming elections and the shakeup is seen as a scapegoat gesture.

Alsogaray's departure brought rejoicing from the "masses," who believe austerity is at an end, and gloom among businessmen, who fear a return to inflationary policies and possible anti-business moves. Under the new Economics Minister, Roberto Alemann (formerly Commercial Minister in Washington), Argentina's economic policy will probably remain about the same.

Accompanying the government shake-up last week was an Army command reshuffle, removing from power militarists believed sympathetic to an overthrow of Frondizi, strengthening the faction which wants to keep Frondizi in power while preventing him from veering too far left.

Charting New Courses

In numerous annual meetings last week, CPI companies were laying the groundwork for new growth programs —acquisitions, mergers, plant expansions and new product lines.

One major decision by stockholders came in concurrent meetings held in Cleveland by Industrial Rayon and Midland-Ross. Shareholders of both companies approved the proposed merger of the two companies.

Midland-Ross—which will be the surviving corporation — is already known to many CPI companies through its process equipment manufacturing divisions. The J. O. Ross Engineering Division produces atmosphere control equipment for paper mills, low-temperature driers, ovens, heating and ventilating systems, and web conditioners. It also produces a line of high-temperature hot-fluid heating systems.

Waldron-Hartig Division makes machinery for paper and textile converting, and equipment for plastic coating, laminating, impregnating and extrusion. Surface Combustion Division turns out high-temperature furnaces, soaking pits, heat-treating equipment and dehumidifying and bacteria-control equipment. Janitrol Aircraft Division makes heat exchangers, pneumatic and hydraulic controls, and combustion systems and accessories for gas turbines.

In Wilmington, Del., Atlas Powder's stockholders ratified the proposed merger with the Stuart Co., thus putting Atlas into the pharmaceutical industry (CW, April 1, p. 22). As Stuart's shareholders had approved the move on the previous day, it's expected that the merger will be carried out May 31.

On that same date, Atlas will change its name to Atlas Chemical Industries, Inc., and will split its stock four-for-one. President Ralph Gottshall says the new name "more accurately characterizes the growing diversity of our operations." After the merger and stock split, Atlas capitalization will include: \$100-par preferred stock, 100,000 shares authorized and none issued; no-par Class A stock, 96,690 shares authorized and issued; \$20-par common stock, 1,450,000 shares authorized and 761,045.5 issued; and \$1-par common stock, 6

million shares authorized, 3,440,782 to be issued immediately, and an additional 580,140 shares to be issued to principal stockholders of Stuart on full conversion of the Class A stock.

At Philadelphia, President William P Drake told the 111th annual meeting of Pennsalt Chemicals stockholders that the company is planning to shift toward greater proportion of business in specialty chemicals as a move to attain higher profit margins. But he acknowledged that for the present, this program is having the opposite effect. High costs of new pilot plants in operation during the past quarter were one big factor in the earnings drop, he stated; and he added that still other pilot plants are scheduled to be started up during the next 18 months. Nevertheless, Drake says he's still confident that 1961 "will be our fourth consecutive year of improved sales and earnings."

Drake mentioned two new products for which the company has high hopes this year: Aquathol, an endothal-based liquid or granular herbicide for killing aquatic weeds without harming fish; and Kynar, a vinylidene fluoride plastic (used in making the gavel Drake wielded at the meeting).

Union Carbide's stockholders were told that the chemicals division had introduced 40 new products during the past year, and that first-year volume on those new products amounted to \$3 million. A spokesman for a group of Carbide employees who are also shareholders urged management to make vacation and other employee benefits the same for employees of Union Carbide Canada as they are for Carbide employees in the U.S.

At Houston, Tex., stockholders of Texas Gulf Sulphur approved one proposal to permit annual meetings to be held in cities other than Houston and another providing for a restricted stock option incentive plan for company executives. After the meeting, executives and directors went to Wharton (near the company's giant Boling Dome mine) where they and a group of TGS employees and their families were guests at a town-sponsored barbecue and party. Purpose of the event was to pay tribute to TGS "for 33 years of friendship and cooperation" in the Wharton community.

ICI Reports

As the Kennedy Administration's new tax proposals (CW, April 29, p. 24) sharpen debate over the effects of U.S. foreign investments on the balance of payments, U.S. chemical companies have some welcome new evidence from abroad on the relationship between investment and exports.

In its annual report for 1960, Britain's Imperial Chemical Industries shows how its exports have continued growing along with its rising overseas manufacturing.

ICI's overseas subsidiaries now produce a sales volume about equal to the parent company's total exports. Nonetheless, exports keep growing: they rose 10% last year to a record \$270.4 million. Total overseas sales—of British and locally made materials—was about \$714 million; the company's total sales were around \$1.6 billion (CW Business Newsletter, April 1).

Many of ICI's customer nations, are clamoring for locally made products; despite this, export volume has been lifted largely because the more sophisticated items—e.g., plastics, dyes, Terylene polyester fiber — are in increasing demand. Terylene exports alone accounted for nearly half '60 exports; fertilizer and basic chemical export demand, on the other hand, slipped noticeably.

Export Pattern: ICI's exports to European Free Trade Assn. countries rose 23% in '60, the reports says, while exports to the Common Market



ICI's Chambers: Bigger sales abroad —both by affiliates and in exports.

increased 26%. (Britain, of course, is a member only of EFTA.)

Although the company's exports to the Soviet bloc still represent less than 6% of ICI's exports, '60's sales there were almost twice '59's.

ICI's domestic expansion is entering a new phase. Emphasis on capital expenditures is shifting from costly expansion of existing plants to construction of large, all-new plants. Last year ICI spent \$95.2 million on construction programs in the U.K., compared with \$89.6 million in '59 and \$126 million in '58. At the year's end, some \$126 million that had been appropriated was still unspent. Outlays for research and development came to \$42 million, including technical services.

Plastics for India

India will be seeking more foreign chemical companies to help build up its plastics industry. The government has raised its sights on plastic production in its third five-year plan to 125,000 tons of plastic goods by the 1965-66 fiscal year.

Originally the target was 80,000 tons, but now the government wants to step up exports to neighboring markets. Indian plastics output now is 20,000 tons/year. But the supply situation is very uneven. Except for electrical grades, India is self-sufficient in phenol-formaldehyde, and will produce urea-formaldehyde molding powders when several already-approved plants are built. Low-density polyethylene is produced, but is in short supply.

In the latest Indian plastics venture Sahu Brothers, managing agent of the Dhrangadhra Chemical Works, formed a \$10.5-million company to produce 15,000 tons/year of polyvinyl chloride and 50 tons/day of liquid chlorine. It will be set up in Madras state, probably with French and Japanese assistance, and will draw on chlorine from Sahu's caustic soda plant in southern India. The company has also received government permission to boost its rayon-grade caustic soda capacity from 30,000 tons/year to 50.000 tons.

As part of the new five-year plan, the Indian government wants a company to build an \$8-million, 4,000tons/year polyethylene plant near the Naharintiya oilwells in Assam state. Fertilizer, carbon black and synthetic rubber plants are also planned for the area. Rumanian engineers are setting up a refinery in Assam.

Meanwhile, a reported behind-thescenes argument within the Indian government may have an important bearing on the investment climate there. The U.S. has offered to help finance construction of a steel mill, if U.S. companies could own part interest. Some Indian planners favor the idea, but most want basic steel production to remain in the public sector.

Australian Outlook

Promising prospects for chemical industry investments in Australia are cited in an unpublished economic feasibility study* recently completed by the government of New South Wales, the country's most industrialized state.

High - nitrogen - content fertilizers are considered an "outstanding opportunity." Right now no urea is produced in Australia, and imports totaled only 9,376 tons in the fiscal year ended July 1, '60. But, says the report, "Australian demand could be about 1 million tons/year within about 10 years, if a suitable educational and sales promotion program is undertaken by the manufacturers."

Australia in fiscal '60 imported 69,-700 tons of fertilizer, valued at about \$1.5 million. This included 396 tons of ammonium sulfate, 36,206 tons of potassium salts, 23,722 tons of other types.

The fertilizers currently produced in Australia, particularly superphosphate and ammonium sulfate, are too low in nitrogen content to boost plant yields adequately. And Australia is lagging behind some other countries in agricultural productivity. In wheat, Australia's major crop, yield per acre is only 17.1 bu., compared with 20.2 in the U.S., 25.2 in Canada, 32.1 in France.

Other chemical investment candidates cited in the report: silicoaluminum catalysts, now approaching a 10,000-tons/year market; tetraethyl lead, imports of which are valued at \$2.24 million/year; and calcium carbide, whose imports were worth \$1.1 million in the fiscal-'60 period.

* Available at New South Wales Government Office, 680 Fifth Ave., New York City.

national roundup

Rounding out the week's domestic news.

Companies

Catalin Corp. of America (New York) has established Macaw Corp. as a wholly owned subsidiary to operate as a distributor of plastic raw materials—including polystyrene, polyethylene, polypropylene and nylon. Macaw also will carry out processing, compounding and coloring work for its resins customers.

Pigment & Chemical Co. Ltd. (Montreal) has acquired Canadian Felling Zinc Oxide Ltd. (Milton, Ont.). Previously, Pigment & Chemical acted as sole selling agent for Canadian Felling.

McKesson & Robbins (New York) is organizing Norcliff Laboratories as a wholly owned subsidiary to manufacture and market a line of proprietary drug products.

Resisto Chemical (Wilmington, Del.) has acquired Transpolymer Corp. (Norristown, Pa.), and plans to use certain Transpolymer equipment and products in manufacturing coatings and other materials. Transpolymer—whose products include acrylic resins and methacrylate monomers and polymers—will operate as a Resisto subsidiary.

Pittsburgh Plate Glass Co. (Pittsburgh) has gained an important new customer for its automotive glass products—General Motors' Fisher Body Division. GM has purchased all of its outside requirements for auto glass products from Libbey-Owens-Ford Glass Co. for the past 30 years. It has just given PPG an order for part of its '62 model needs, with first deliveries to begin this summer. PPG is a major supplier to Chrysler, American Motors and Studebaker-Packard; but over the past two years Chrysler and Ford (formerly another big PPG customer) have been shifting increasingly to captive production.

Expansion

Sodium Borohydride: Metal Hydrides Inc. (Beverly, Mass.) has acquired formerly government-owned equipment at Danvers, Mass., in a move to expand its production capacity for sodium borohydride. The equipment is in a plant that was built under a U.S. Navy contract in '57; it turned out more than 1.7 million lbs. of sodium borohydride but has been shut down since mid-'59. The plant stands on a 10-acre portion of an 80-acre tract owned by the company.

LPG Hydrocarbons: Atlantic Refining Co. (Philadelphia) will have O. L. Olsen Co. (Houston, Tex.) build a \$1.5-million refrigerated absorption gasoline plant near George West, Tex. The unit will be designed to process up to 90 million cu.ft./day of natural gas and extract up to 32,000 gal./day of propane, 17,500 gal./day of butane, and 7,600 gal./day of gasoline. The plant will also produce high-purity ethane.

Halogenated Plastics: Tube Turns Plastics (Louisville, Ky.)—an affiliate of Chemetron Corp. (Chicago)—is equipping a plastic fabricating plant at Dallas, Tex. Standard shapes and custom-molded thermoplastic industrial parts will be manufactured. Initial production will be from Teflon fluorocarbon resin, but the company plans to use other halogenated plastics

Fibers, Resins: Allied Chemical has three principal expansion projects under way now, stockholders were told last week. The apparel-denier nylon fiber plant near Columbia, S.C., is to be in partial operation by October; a 20-million-lbs./year polyether plant at Baton Rouge, La., will go onstream in July; and a tripling of capacity for diisocyanates at Moundsville, W.Va., will be completed by mid-'62.

foreign roundup

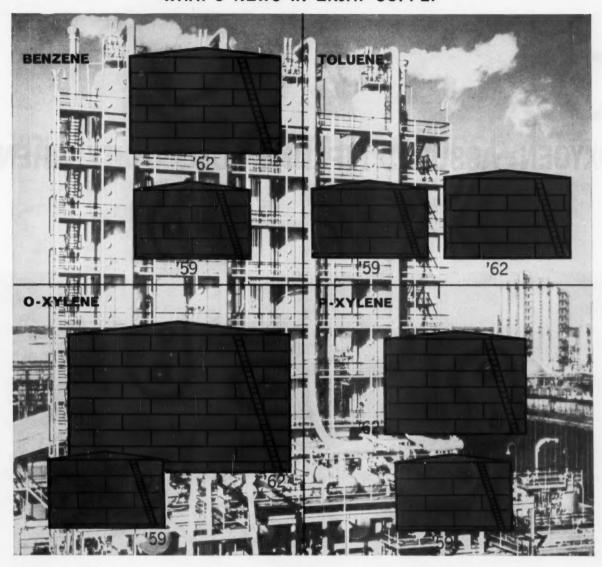
Rounding out the week's international news.

Monochloroacetic Acid/U.K.: Two products not now made in Britain—monochloroacetic acid and sodium monochloroacetate—will be produced at a new plant to be built by Courtaulds Ltd. The plant will be adjacent to British Celanese Ltd.'s (not affiliated with Celanese Corp. in the U.S.) plant at Spondon. It is expected to go onstream in early '62 and to supply the total U.K. market, plus exports.

Ammonia/U.K.: A joint company formed by Fisons Ltd. and Esso Petroleum (50-50) will build a 150,000-tons/year ammonia plant adjacent to Esso's Milford Haven, South Wales, plant. The ammonia plant is scheduled to go onstream in the spring of '64, the same time as Fisons' nearby nitrogen products plant.

Petrochemicals/Germany: Caltex Oil GmbH. will build a refinery on land subleased from Farbwerke Hoechst at Frankfort, and will supply Hoechst with petrochemical materials. A long-term contract signed by the two companies provides for crude distillation, hydrotreating, and a cracker for the production of olefins. The \$50-million plant is scheduled to start production by the end of '63.

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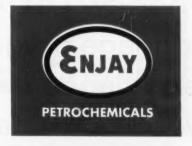
	CAPACITY		
	1959	1962	
BENZENE million gal/yr	45	79	
TOLUENE million gal/yr	32	55	
ORTHOXYLENE million gal/yr	6	24	
PARAXYLENE million lb/yr	65	105	

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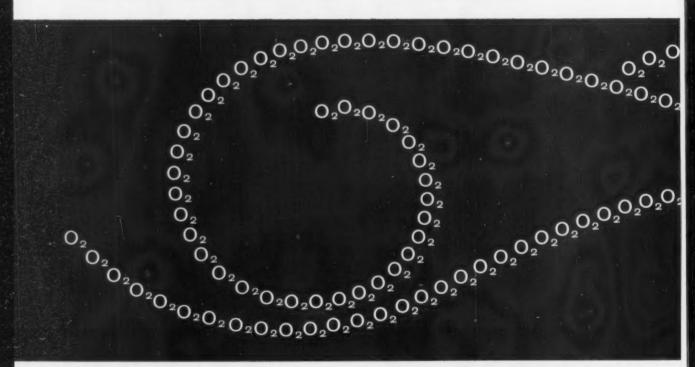
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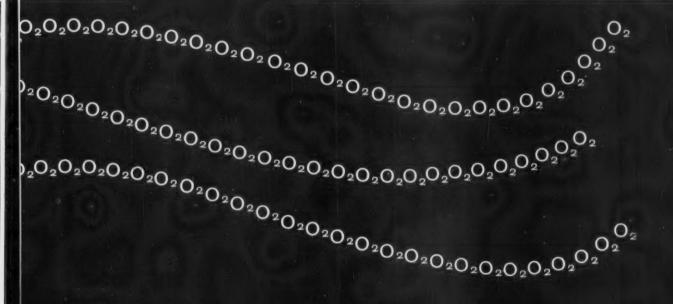


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Nonprofit Labs Brace for a New Tax Bite

Previously tax-exempt on all of their research income, nonprofit labs are now liable to a federal levy on some of this revenue.

Nonprofit research laboratories will start paying federal income taxes this year, but the amount is likely to be small (CW Technology Newsletter, April 29). A recent Internal Revenue Service ruling spells out in detail what it considers tax-exempt, scientific research done in the public interest. Other types of "unrelated" business carried on by the nonprofit labs are taxable; but the exemptions are broad enough to cover most of the work done at the labs.

Nevertheless, tax-paying commercial labs are likely to derive some consolation from the new ruling. It has long been their contention that much of the business done by the nonprofits was turned over to organizations that used the information for profit-making purposes and therefore should be taxed.

The reaction of the nonprofits to the IRS ruling is mixed. Openly relieved about the new definition is Stanford Research Institute, which had been after the government for several years to clarify the tax laws on this point. Others show less enthusiasm. Typical comment: "wait and see" and "it won't affect us."

These labs have another nagging but unrelated concern: a coming investigation of nonprofit organizations doing work for the government. The probe will be conducted soon by the House Science and Astronautics Committee, headed by Rep. Overton Brooks, Louisiana Democrat (CW Washington Newsletter, April 29). Although most institutes perform significant percentage of their work for the government, they point out that the investigation is aimed primarily at firms set up to do government work exclusively (e.g., Rand Corp., Mitre Corp.). The committee agrees that this type of firm is its prime target, but it doesn't rule out the possibility of including the research institutes.

SRI and IRS: According to Stanford Research Institute's executive vice-president, Weldon ("Hoot") Gibson, SRI is glad to have the tax situation clarified. For a number of years IRS's interpretation of its '51 ruling that nonprofit institutions could be taxed on "unrelated business income" did not cover the research institutes, since all their business is research and, therefore, "related." In '57 IRS raised the question of whether proprietary research (that done for the exclusive, profit-making use of a private sponsor) might not be "unrelated" to the work done "in the public interest."

In the new IRS ruling (published in the Jan. 11 issue of the Federal Register, "scientific" research is carefully defined to distinguish it from other types of research that are considered not in the public interest and therefore taxable. Tax-exempt scienific research includes: work where Il patents, copyrights, processes and formulas are made available to the public on a nondiscriminatory basis work performed for the U.S. government or any of its departments, agencies or political subdivisions; other work done in the public interest, such as research aimed at curing a disease. aiding in scientific education, aiding a community by attracting industry, and developing new scientific information for publication.

Specifically excluded from the definition (and therefore taxable) are ordinary testing or inspection and design or construction of equipment or buildings. The new ruling applies to taxable years since Dec. 31, '53, according to IRS, but the statute of limitations for most firms goes back only three years.

Varied Reactions: Reactions to the

Varied Reactions: Reactions to the IRS ruling have been on the guarded side, but some differences are evident. Rollin Osgood, assistant director and treasurer of Southern Research Institute, sums up the general feeling of the nonprofits, saying, "These new tax regulations are somewhat difficult to interpret at present. We feel, however, that our tax liability, if any, would be small in view of the preponderance of health, defense and basic research we are doing here."

Agreeing that the matter needs study, Edward Slowter, Battelle vice-president, says that Battelle will probably not decide until the end of the year what part, if any, of its income is taxable. Martin Goland, president of Southwest Research Institute, says that SwRI is not now paying federal taxes, and he indicates that he does not expect that it will. Herty Foundation Laboratories expects to be completely exempt on the basis of its origin as "an instrumentality of the state of Georgia," although it is not now supported by state funds.

Spokesman for roughly 75 commercial laboratories (e.g., Foster D. Snell, Inc., United States Testing Co.) has been the American Council of Independent Laboratories. ACIL has been an outspoken critic of tax distinctions between nonprofit and profit labs. And Johann Biorksten president of non-ACIL-member Bjorksten Industrial Laboratories, calls the new ruling a step in the right direction, but questions how much tax will actually be levied. Rather than taxes for nonprofits. Biorksten says he would prefer tax-exemption for commercial labs. Arthur D. Little, Inc., largest of the commercial labs, has stayed clear of the discussion to date, makes no comment on the latest ruling.



SRI's Gibson: Clarification needed





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Sound Breaks Foam Barrier

Companies offering sound generators for industrial processing work have ruefully watched many of their highest hopes vanish like bursting bubbles. It's fitting therefore that bubble-bursting is likely to become a major success for sound generation. Teknika, Inc. (Hartford, Conn.) and General Precision, Inc.'s Kearfott Division (Little Falls, N.J.) have sonic defoamers that are earning high grades in performance tests.

Big advance made by both companies is in markedly increasing the effectiveness of the foam-killing while greatly reducing the power requirements. Moreover, both are tailoring their devices to closely fit chemical processors' needs.

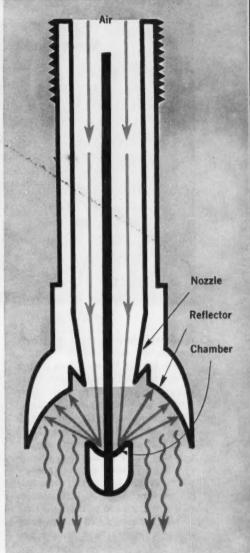
Suds-Killer: Teknika already has one sound generator performing successfully in industry—defoaming shampoo during processing. Stanley Rich, the firm's president, admits that defoaming shampoo is one of the easier tests for the generator. But his unit is now tackling troublesome materials such as heavy-duty detergents, pharmaceuticals, polymers and paper chemicals, food products and beer.

Kearfott has been working with companies in many of these same areas on plant-scale test programs.

Teknika and Kearfott are at opposite poles in their methods of generator development—extremes that seem to typify the industrial sound generation field's development. Teknika's Rich, who has been in the acoustical field for many years, came up with the design idea for his sound generator in January, went commercial in March and is just now filing patent applications. Kearfott began experimenting in the field about two years ago. It has been cautiously proving its generator in long-term field trials and probably won't go commercial for another four months. Its sound generator patents are expected to be issued shortly. (see diagram, right).

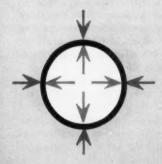
Low-Pressure Defoaming: Despite their extremes in developmental approach, the two companies appear to have equal chances of success, since both emphasize that their units have comparatively low power requirements for generating high-intensity sound. Teknika's generator will produce sound when air is blown through it at less than 5 psi. Effective defoaming of easily broken bubbles begins at about 12 psi., and most liquids can be defoamed under less than 40 psi. air (see Dimension, p. 52). Kearfott's generator operates in the 15-27psi range.

Charles Berry, Kearfott's assistant to the president, says the target for generator operating cost should be about 5\$\phi\$/hour. This means that gen-

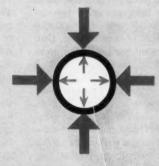


In Kearfotts' generator, compressed air is jetted through nozzle into chamber, causing chamber to resonate. Reflector directs sound toward foam.

How Sonic Defoaming Works



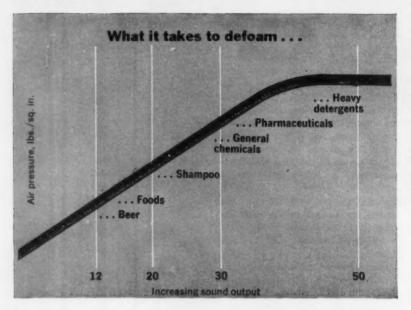
EQUAL PRESSURE outside and inside bubble wall is condition before a sound wave hits bubble.



BUBBLE COMPRESSES when cyclic sound wave hits. Outside pressure increases during part of wave cycle.



BUBBLE BURSTS when outside pressure becomes less than inside pressure during remainder of wave cycle.



erator efficiency must be over 20% for effective defoaming.

Low-Whistle Waste: This is a much more stringent requirement than most sonic generators have previously faced. Use of ultrasonics (sound waves above 20,000 cycles/second) for cleaning and degreasing in liquid baths was a relatively simple application that didn't require high efficiencies. But efficiently generating sound waves in air for liquid defoaming proved formidable. Earliest attempts with sirens, similar to those used for air-raid warning, failed on this score—also, equipment was massive and foam fouled the moving parts.

The Hartmann whistle, developed in Germany, eliminates moving parts by directing air into a chamber, which resonates in a manner similar to that of Kearfott's sound generator. But its efficiency was low, only about 2%. Raymond Boucher (now at New York University), working in France, made major improvements in the Hartmann whistle. Gulton Industries marketed the improved device, which it called the Multiwhistle Air-Jet Ultrasonic Generator. It was aimed at a variety of applications (CW, Oct. 13, '56, p. 78). Eventually, however, the company dropped it.

Kearfott and Teknika have advanced the designs to the point where lower energy requirements now make defoaming practical. Trying to emphasize their improvements, both

firms prefer to call their devices generators, make no references to whistles.

Breaking Bubbles: Despite their renerators' improved efficiencies, Kearfott and Teknika emphasize that they do not answer all defoaming problems—at least not yet. For example, Berry points out that high-protein foams are still difficult to break. And Rich lists a number of complex properties—e.g., viscosity of the bubble film, surface tension, thickness, size of bubble and temperature—that affect defoaming, but to an unknown degree.

Some points are known—e.g., bubbles are easier to break at higher temperatures, according to Rich. But there is not even complete agreement on the theory of how the bubbles are burst. Rich explains one theory this way:

Sound waves can be described as pressure variation. When the waves are intense there are great pressure variations—from well above atmospheric pressure to near vacuum. During the pressure portion of the cycle, the bubble is compressed and is strengthened. During the vacuum portion of the cycle, the pressure inside the bubble is much higher than on the outside, and the bubble explodes.

But another explanation of bubble bursting is that the wall of the bubble vibrates so violently it is shattered. In either case, however, when sound waves are generated with a frequency above 8,000 cycles/second, defoaming is practically instantaneous, and columns of foam many feet high can often be collapsed in a few seconds.

Close to the Foam: Generally the generators can be located 6-10 in. above the liquid level. And according to Rich, they can be placed on 2-ft. centers for foams that are easily broken down, but may have to be placed on 6-in. centers for difficult foams. Although Teknika's generator sells for about \$150 when bought in quantity (Kearfott has not yet established a price but says it will be "competitive"), costs can mount up for large tanks.

One technique that cuts down the number of generators needed: closing the top of the tank, permitting the foam to rise in a standpipe that is fitted with generators. An electric-eye detector in the standpipe can be used to operate the unit intermittently.

Enclosing the tank has an added advantage: it hushes the 150-decibel sound at which the generators must operate.

Ultrasonics, Too: However, tanks can't always be enclosed. Paper-coating tanks, for example, through which paper is continuously fed, are hard to seal off. In tests on such tanks, Teknika uses generators that operate in the ultrasonic range (25,000 cycles second). Although there is some drop in defoaming efficiency, there is no discomfort to the workers. Rich explains that the efficiency drop occurs because bubbles are large, compared with the wave length, may be subjected to part of pressure cycle on one side and part of vacuum cycle on the other. Also, the bubbles may not have time to explode.

Rich says that 8,000-14,000 cycles/second is the best frequency for operation. Kearfott operates at about 10,000-12,000 cycles/second, has no ultrasonic generator. Both companies point out various methods that can be used to shield workers from the sound; both offer engineering services in sound muffling.

However, the major engineering problems the two companies will face seem certain to be in the area of hard-to-defoam materials, rather than in overcoming noise. But sonic defoaming clearly has finally reached the stage where it is worth a close look by the chemical process industries.

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State Application
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Better Starting Power

A gas generator for starting jet aircraft engines and rocket boosters—now under development at McGregor, Tex., by Rocketdyne, a division of North American Aviation, Inc.—may find a place in chemical plants. Potential uses: to start plant emergency power equipment, and to pressurize tanks and pipelines.

The gas generator, a cartridge that resembles a 2-lb. coffee can, is 8 in. long and 6 in. in diameter. It is filled with solid propellant (e.g., zirconiumnickel alloy, barium nitrate, potassium perchlorate), which is rapidly converted into gas when ignited with a small (about 1 amp.) electric current. The units are tailored to fit the application. For example, one cartridge for starting jet aircraft develops 430 hp. for 17 seconds; a cartridge for rocket-booster ignition develops about 1,500 hp. for 1 second.

Although the major market for the new generator is expected to be the military, Rocketdyne's program engineer, Rex Bessire, says the power package could catch on in industry. For example, it could replace storage batteries, which must constantly be recharged, for starting stand-by diesel and gasoline engines. And it could be used as a starter for gas turbines and a gas source for pressurizing tanks, pipelines and gas bags.

In addition, it has potential applications in oil well drilling and perforating, and might be used to fracture deep wells for chemical waste disposal (CW, Jan. 7, p. 65).

EQUIPMENT

Catalyst Analyzer: Gulf Oil Corp.'s research subsidiary has developed what it calls the world's first automated catalyst analyzer, has licensed The American Instrument Co. (Silver Spring, Md.) to manufacture and sell it. The analyzer can be programed to measure and record the microstructure of refining catalysts. It replaces manual techniques whereby more than 14 man-hours were required to analyze a single sample. Structural characteristics measured: total surface area, pore volume and size distribution of interior holes.

Plastic Storage Tank: Bruner Corp. (4767 North 32nd St., Milwaukee 9)

is out with a new storage tank constructed of an aluminum outer shell, seamless kralastic B or HTHT (butadiene-styrene-acrylonitrile) inner shell, and melamine end enclosures. It can be used to store acids, corrosive liquids, hot water to be used for ion exchange and demineralization. Bruner claims that the tank can withstand 500-lbs. bursting pressure, temperatures of 185 F with B shell and 225 F with special HTHT shell. The tank has 0.5-cu.ft. volume; is 7 in. in diameter and 24½ in. long.

Metering Pump: The Milroyal is Milton Roy Co.'s (1300 East Mermaid Lane, Philadelphia 18) metering pump that features a new method of strokelength adjustment. The pump has a worm shaft and gear, crank with adjustable axis, and a connecting rod with a ball-socket end, which permits adjustment from the forward end of the stroke. Capacities range from 0.89 gph. (for pressures up to 4,470 psi.) to 88 gph. (for pressures up to 170 psi) with ½- to 1-hp. motors.

Automatic Analyzer: A new Auto-Analyzer (CW, Aug. 9, '58, p. 66) has been developed by Technicon Controls (Chauncey, N.Y.) for continuous chemical analysis down to parts per billion with 1% accuracy. The unit can be used for materials such as cyanides, chlorides and sulfates. It uses two individual beam colorimeters to measure, mix, purify, compare and record up to 60 tests untended. Selenium photocells are used for the 400-650-mu. wave length range; silicon photocells, for the 600-950-mu. range.

Level Controller: A new line of level-control instruments has been introduced by Brooks Instrument Co. Inc. (Hatfield, Pa.). The devices feature a magnetic position converter that changes the linear float movement into a rotary motion for indication. This MPT series can combine in a single instrument indication, alarm, on-off control and either electric or pneumatic transmission. It is sensitive to 0.25% at temperatures up to 800 F and pressures to 40,000 psi. The controller can transmit level measurements from buoyant, as well as displacer floats, has a buoyant float range of 0-24 inches, about five times that of other instruments.

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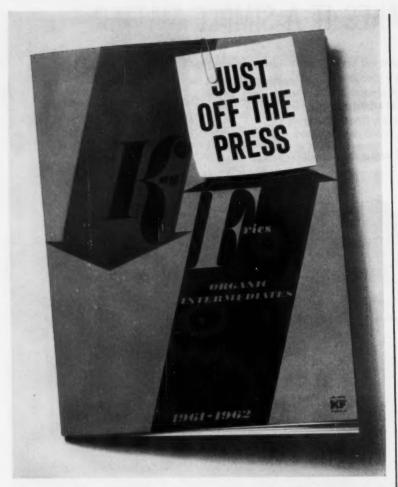


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PRODUCTION

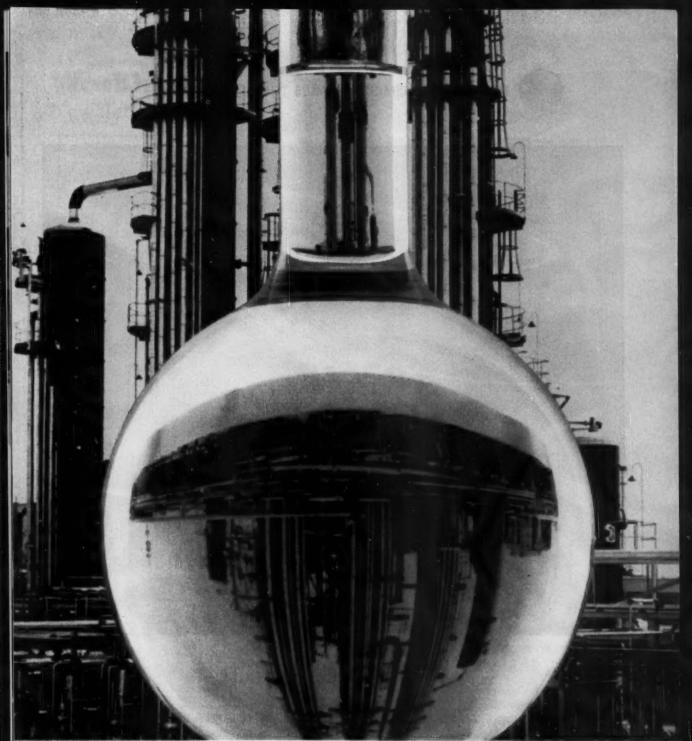
Tank Heater: The Griscom-Russell Co. (185 Westmore Ave., Massillon, O.) is marketing a new tank heater that weighs only 170 lbs. and can be carried over rough ground in a tank farm by two men. The heater, called Type KH-223, has two lengths of 1-in. Schedule 40 steel pipe with helical aluminum K fins. It will pass through a standard API 20-in. manhole, can be used singly or in stacks.

Analog Converter: A portable analog-to-pressure converter for electromechanical measurement and control of pressure or vacuum in pipe lines is a new product of Motec Industries Inc. (6344 Arizona Circle, Los Angeles). It's the size of a weekend suitcase, has an accuracy of 0.025% according to the maker.

Tube Coupling: Dynatube is Resistoflex Corp.'s (Roseland, N. J.) new high-temperature, high-pressure rigid-tube coupling with a leakproof metal seal. The coupling's seal is self-locking, has a grooved ring behind the metal seal face that increases efficiency at higher pressures and resists vibration, shock, pressure overloads and pulsations. It can be used in cryogenic applications and for liquids and gases at temperatures to 700 F. The seal is leakproof (e.g., with helium at 5,000 psi.).

Portable Pump: The Edson Corp. (305A South Water St., New Bedford, Mass.) is now introducing a new portable pump. It is manually powered, has a 32-in. lever, is self-priming, has a rubber diaphragm and neoprene valves. It's made of aluminum, bronze or stainless steel, weighs 10½, 29½ or 37 lbs., respectively. Side and bottom inlet models have 25-ft. suction lifts, and liquid capacities of 1,800 gph.

Zirconium-Columbium Tubing: Superior Tube Co. (1513 Germantown Ave., Norristown, Pa.) now offers a new 1% zirconium-columbium alloy tubing that has higher oxidation resistance and greater high-temperature strength than reactor-grade columbium tubing. It's designed for use as a fuelelement cladding and heat-exchange tubing in nuclear reactors. Seamless 0.012-1.125-in. O.D. tubing is available in stress-relieved, half and full hard-drawn forms.



Arizona's new rectifying towers as photographed through a flask of ACINTOL® FA3 Fatty Acid

ARIZONA TAKES THAT EXTRA STEP TO BRING YOU THE LIGHTEST FATTY ACID AT ITS PRICE

In its new plant at Springhill, Louisiana, Arizona has five rectifying towers for fractionating tall oil. Here is one more aspect of Arizona's constant extra effort to bring you the lightest, purest tall oil products available in their price range. It takes this kind of a plant to produce the kind of fatty acid wanted today—a product like ACINTOL® FA3.

New ACINTOL FA3 Fatty Acid is the best example of the power of increased distilla-

tion. It's the palest, purest product in its price range—low in unsaponifiables and rosin acid content. ACINTOL FA3 assures improved color retention and faster drying time. And like all Arizona chemicals, it is uniformly high in quality, eliminates formulation adjustments.

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MH-30 Mowing of state and local highways in the U.S. costs a staggering \$50,000,000 each year.

MH-30, Naugatuck Chemical's new growth retardant, can eliminate mowing, slash costs drastically. In Connecticut, for example, tests on steep embankment areas have demonstrated a 50% saving—up to \$36 an acre—with the use of this chemical.

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dynamic program of chemical research that is making things happen for industry...making dollars go further... making production more efficient...giving products new sales appeal.

Highway maintenance engineers and landscape architects! For information on MH-30 and the economics of chemical mowing, write Naugatuck Chemical, Department C-56, Naugatuck, Connecticut.

NAUGATUCK CHEMICAL DIVISION



United States Rubber

Washington

Newsletter

CHEMICAL WEEK May 6, 1961 A major review of the nation's space program has been ordered by President Kennedy. It will be the first official task of his Space Council, under the chairmanship of Vice-President Lyndon Johnson. The Vice-President already has called in Defense Secretary Robert S. McNamara, Space Administrator James E. Webb, Wernher Von Braun, and Atomic Energy Commission and military space experts to hash over the program.

Sources close to the council say it is likely to recommend more money for solid-fuel rocket development, the nuclear rocket program, the man-in-space program under Project Apollo, and possibly satellites for communication, navigation and weather.

There will be no "crash" program, however. All in all, the council will probably add less than \$100 million to the space program. Its report to the President is expected in a week or so.

More defense contracts for small companies are pledged by Defense Secretary Robert S. McNamara. This could have a major effect on chemical process industries, which always have been an important part of the defense complex. McNamara says he intends to increase the small-business share of defense orders mostly through "personal participation" by himself and the three service secretaries in programs designed to achieve that end.

Last month, the White House ordered the Defense Dept. to step up the volume of prime contract awards to small business by at least 10% in fiscal '62, starting July 1, over the current rate. This would mean an increase of \$344 million worth of contracts. McNamara made his pledge to carry out the White House order to the Senate Small Business Committee.

Scrapping of another Titan II installation is under consideration by the Air Force. The idea would be to replace the underground liquid-fueled missile sites with additional silo launchers elsewhere for the solid-propellant Minuteman missile.

The Administration already has killed plans for a two-squadron Titan II base at Rome, N.Y. But a construction contract for the Rome project had not yet been let. The cancellation now being considered would involve work already under way—presumably at Little Rock, Ark. However, because considerable money has already been spent on this project, the proposal may be turned down.

A chemical propellant safety subcommittee has been formed by the Manufacturing Chemists' Assn. The new group will make available to the military services, other government agencies and contractors technical information on the safety aspects of manufacture, handling, storage and transportation of rocket propellants. Chairman of the subcommittee

Washington

Newsletter

(Continued)

in Ralph Bloom, Jr., of Food Machinery and Chemical Corp.; Vice-Chairman is James G. Chalfant of Olin Mathieson.

An Office of Automation and Manpower has been created by the Kennedy Administration. Labor Secretary Arthur Goldberg, who established the agency in his department, says the chief task is to study the manpower displacement caused by technological advances and find cures for the resulting unemployment.

Goldberg has some harsh words for both management and labor practices in dealing with automation. "If management must automate, and I believe it must, then it must also assume a larger role than it has in the past to ease the transition for human beings. Management has got to stop automatically resisting proposals to ease the human burden of automation [and] labor must meet management halfway. It must abandon restrictive practices."

The government has moved against two big aluminum firms for alleged violation of the antitrust laws. The complaints were filed by the Justice Dept. against Aluminum Co. of America, the nation's largest producer of primary aluminum, and Kaiser Aluminum & Chemical Corp., third largest.

Alcoa, under the government complaint, would be forced to divest itself of the Cupples Product Corp. (St. Louis), which it acquired last year. Kaiser's proposed acquisition of the Kawneer Co. (Niles, Mich.), would be blocked. Justice contends that both transactions violate antimerger provisions of the Clayton Antitrust Act. The cases will be heard in U.S. district court in St. Louis.

The Justice Dept, also asked the courts to order Kaiser to divest itself of an aluminum wire and cable plant at Bristol, R.I., acquired from U.S. Rubber Co. in '57.

The U.S. now wants unification of Europe's trade blocs—the Common Market and the Free Trade Assn., although U.S. exports would probably suffer for a time from such a union. This is a switch from the Eisenhower Administration's position, which opposed unification unless adequate assurances could be given that such a union would not hamper U.S. exports.

Treasury Secretary Douglas Dillon outlined the new Administration's position at a press conference last week. He does not expect trade barriers to be prohibitive, believes the U.S. can afford to pay "some price" for the political advantages to be gained through European economic activity. But a bridge between the two blocs is apparently still not in sight. Until last week, a serious British bid for entry into the Common Market—to be followed by most of Britain's EFTA partners—had been expected soon. But the Algerian upheaval and its implications for future French—hence European—stability seem to have scared Britain off.

Take another look... at Baua FUMARIC ACID



FERMENTATION

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for newly issued 1961 specification and price sheets. Samples are also available for your evaluation.



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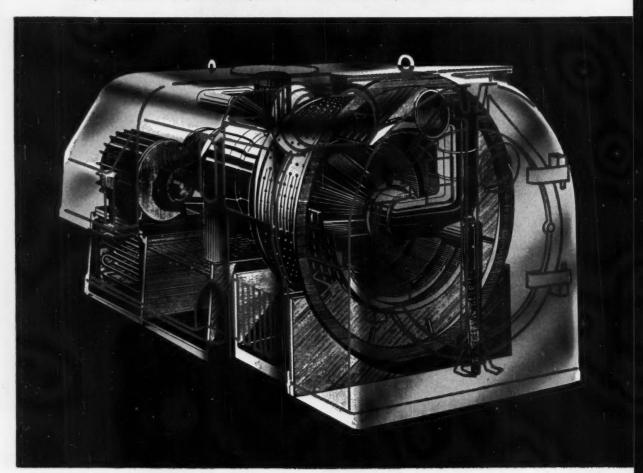
BAKER PERKINS CENTRIFUGALS

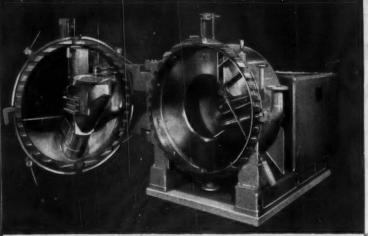
FOR ECONOMICAL SEPARATION OF FILTERABLE SOLIDS

Baker Perkins centrifugals have an enviable reputation for efficiency and economy in centrifugation. The well known Baker Perkins continuous pusher type and automatic universal centrifugals have been used successfully for years to separate many different filterable solids. Now with a multi-stage continuous pusher type centrifugal and an automatic vertical pusher type centrifugal, there is a Baker Perkins centrifugal to separate both slow draining solids and extremely fragile crystals. All Baker Perkins centrifugals are manufactured in many sizes, many different materials of construction and with special design features to meet your process requirements.

B-P (ESCHER-WYSS) MULTI-STAGE CENTRIFUGALS

Continuous centrifugation of difficult-to-handle materials is now possible with new B-P (Escher-Wyss) Multi-Stage Continuous Centrifugals. The continuous multi-stage pusher centrifugal eliminates cake buckling, assures adequate retention time, speeds release of liquids, improves washing, provides better separation of multiple liquid components and reduces power consumption. Models are available with capacities from 1½ tons to 45 tons per hour.





PRESSURE CENTRIFUGALS

The B-P HS 40W is one of a line of pressure centrifugals built for normal operation at 1000 times gravity and pressures up to 150 PSIG. Many new features include: a self-seating, self-aligning door seal, housings that withstand extreme operating pressures, new type discharge knife and chute, and a peeler knife that enters the cake at successively increasing depths, thus eliminating cake glazing.

VERTICAL CENTRIFUGALS

The new Baker Perkins VS-20 Vertical Centrifugal is designed and built to handle friable crystals during charging without danger of crystal degradation. The unit is charged with slurries while running at reduced speeds, then automatically accelerates for the drying and washing operations and automatically decelerates for discharge.



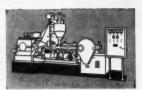
CONTINUOUS CENTRIFUGALS

The B-P Type S Centrifugal has continuous feed and discharge requiring no timing or cycle controllers. It is ideal for centrifuging a wide range of relatively free-draining crystalline materials. Friable solids are handled easily since there are no scrapers, baffles, rakes or plows to cause crystal degradation. Models are available with capacities up to 54 tons per hour of solids.

403

BAKER PERKINS INC.







CONTINUOUS MIXERS . PLASTICS MACHINERY . UNIVERSAL MIXERS

SAGINAW, MICHIGAN

May 6, 1961 CHEMICAL WEEK 63



THE LITHIUM REACTOR

CURRENT INFORMATION ON CLITHIUM CHEMISTRY AND METALLURGY

SEC-BUTYLLITHIUM NOW AVAILABLE FROM LITHIUM CORPORATION OF AMERICA

In addition to *n*-butyllithium, LCA is now able to offer commercial quantities of *sec*-butyllithium. Like *n*-butyllithium, this compound is supplied as a hydrocarbon solution. General chemical properties, uses, concentration, availability, packaging, etc., are the same as for *n*-butyllithium.

However, one important difference is its lower thermal stability. While n-butyllithium is completely stable at room temperature for at least six months, sec-butyllithium will show a decrease of several per cent of its original assay after three to four weeks, and about ten per cent after six weeks. At temperatures in the 10-15°C range (or lower) there is no significant loss in six weeks. In view of this, it is apparent that for extended storage a temperature of 10-15°C or lower should be maintained. For further information write our Technical Service Department in Bessemer City, N. C., for our data sheets 106-361 and 106-A-361 which are available on request.

Packaging

Quantities of 5 to 125 lbs of contained sec-butyllithium (or n-butyllithium) are shipped in returnable ICC4BA-240 cylinders, requiring a deposit. Small quantities are packed under nitrogen in screw-top ½-gallon and 1-gallon metal cans containing ½ lb and 1 lb of material, respectively.

For details of packaging, as well as for handling and safety precautions, refer to our Bulletin 201-A-960, avail-

able on request.

LITHIUM IN BRIEF

New developments involving lithium are constantly appearing in the literature. Each month some will be mentioned here briefly.

A Swedish patent describes the use of mixtures of various polyphenol ethers, made by reacting lithium-m (m-phenoxyphenoxy)-phenate with substituted monoor dibenzenes, as lubricants in jet and gas turbine engines. (4521)

A process for the enrichment or separation of tantalum and niobium employs double salts of TaCl₅ and lithium halides. (4206)

The reaction of n-butyllithium and benzyl chloride in ether gave a 14% yield of 7-phenylbicyclo-(4.1.0) heptane. This is evidence of the formation of intermediate phenylcarbene. (4538)

Lithium chloromethyl-phenyl ether was prepared by the metalation of chloromethylphenyl ether with butyllithium. On α -elimination this yielded phenoxy-carbene and lithium chloride. (4606)

Lithium-magnesium alloys are heat treated in a hydrogen atmosphere to convert the lithium to lithium hydride, resulting in improved high-temperature strength. In addition to structural uses, these alloys have application as a lightweight neutron shielding material. (4135)

For further information, write our Technical Service Department, Bessemer City, North Carolina.



A number of years ago, the lithium metal commercially available contained approximately 0.6% sodium. In an effort to supply a more pure metal, the sodium content was lowered to the current level of only several hundredths of a per cent, or less. For certain uses, this was advantageous,

but not in all cases.

Various workers have gradually accumulated evidence indicating that the reactivity of lithium metal in the preparation of organo-lithium compounds is greatly influenced by its sodium content. Certain preparations are impossible when using lithium metal with less than 0.005% sodium, whereas 0.02% sodium is effective. Other preparations, notably tert-butyllithium, require as much as 2% sodium for good yields. While the complete story is not yet available, there is little doubt as to the real nature of this effect.

To supply the requirements of organic chemistry, LCA now offers, on a custom basis, lithium wire and ingot with a sodium content of approximately 0.8 to 1 weight per cent, and lithium dispersions with a sodium content of 1 to 2 weight per cent.

IMPROVED METHOD FOR DETERMINING BUTYLLITHIUM

A new method for the determination of n-butyllithium in hydrocarbon solution was published in the March 1961 issue of ANALYTICAL CHEMISTRY, by P. F. Collins, C. W. Kamienski, D. L. Esmay and R. B. Ellestad of the LCA Research Laboratories.

The basis of this method is the quantitative oxidation of n-butyllithium by vanadium pentoxide, followed by a potentiometric titration of the reduced vanadium with sulfatoceric acid. Advantages of this oxidimetric method over the usual acidimetric double titration method include increased accuracy, ease of reagent preparation, and absence of blank corrections. The method is also applicable to other alkyllithium compounds.

For information sheet with procedure details ask for Bulletin 201-960 from our Technical Service Department, Bessemer City, N. C. Reprints

also are available.



LCA's recently completed new laboratory installation houses greatly expanded research facilities and staff under centralized direction.

LITHIUM CORPORATION OF AMERICA, INC.

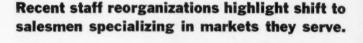
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SALES AND DISTRIBUTION



Pittsburgh's McLaughlin: Specialization means greater efficiency.



Pleasing the Customer: A Job for a Specialist



line coatings.

An Old Fight: Organization on industry lines such as these is not a new thing. It has been tried before by many chemical process companies. But with few exceptions, product-oriented experts in certain lines that they sell to a broad spectrum of industry have up to the present time far outnumbered the market specialists.

The slow economy, and the demand for greater salesman "productivity,"



Monsanto's Greene: Eye on market volume.



Heyden's Deakyne: Line salesmen gain too.

nies to a re-examination of sales staff operation. And although the product specialist is by no means on the way out, many sales managers now feel the best way to reach customers is with an expert trained in that particular field.

however, have brought some compa-

For those that have revamped their selling approach, the factors leading up to the change provide some useful guide lines. Moreover, their methods of changeover are noteworthy.

Transition: Monsanto, for example, weighed the effects of growing competition, more complex markets, more specialized products, and decided that a shift from traditional product emphasis might be worthwhile. But before reorganizing its sales forces for industry orientation, it tried the ap-

Market specialization — a revised and expanded marketing tool—is getting a new chance to prove its worth: Allied, Armour Industrial Chemical Co. and Pittsburgh Chemical Co. are putting the idea to work, sending customer-oriented salesmen into the field. Similar plans, inaugurated by Monsanto, Kaiser Aluminum and others, are already beginning to turn up evidence of its effectiveness.

The aim of these reorganizations is to send better-qualified salesmen out on calls—to provide improved information feedback and allow the manufacturer to keep closer tabs on customer trends and needs. How it's done depends pretty much on the manufacturer's products. Allied does it in its fiber department by dividing the marketing responsibility into three end-use

proach on a relatively smaller scale.

A check of organic chemical sales in the New York district showed that the majority of its big customers were within 30 miles of Manhattan. Assured of an adequate market in a relatively easy-to-cover area, Monsanto then specialized its organics salesmen for the specific industries—plastics, drugs, paint, rubber, petroleum and a miscellaneous category. The result was not only greater sales volume but also more sales per call. With this to guide it, Monsanto made the shift nationally.

If market specialization is an untried sales venture, a test area can be valuable in spotlighting potential troubles and gauging effectiveness.

But many firms already employ some degree of market-oriented selling, especially with specialty chemicals or products with limited end-uses. Sometimes this "incidental" market specialization evolves into a formal program. General Aniline & Film's dyestuff salesmen specialize mainly in the textile, leather and paper fields, and are both market-and product-oriented specialists.

When end-uses can be narrowly defined and sufficient sales volume exists, market specialization comes naturally with product orientation. Pennsalt illustrated this when it grouped its specialty sales forces according to the industry served: laundry and drycleaning chemicals, household products and metal-processing products. "But for general chemical sales—acids, amines, organosulfurs, etc. — which have countless end-uses, it would take too big an organization to maintain market specialists in all these areas," explains a Pennsalt spokesman.

Frequent Studies: By continually analyzing its sales effectiveness, a company could observe the growth of a market until specialization becomes a necessity. Pittsburgh Chemical, for example, charted growth of specific markets for its protective coatings division. Finally the sales force became too unwieldy for a broad product-oriented staff to manage effectively. As a result, it split the division into two market-specialized groups: industrial coatings and pipeline coatings.

In further subdivision, industry managers in the industrial coatings group will concentrate on the marine, iron and steel, petroleum, chemical processing, pulp and paper industries

and military applications. Reports

Pittsburgh's protective coatings assistant general manager, William Mc-Laughlin: "We can't say yet how this shift has affected sales, but market specialization does appear to be more efficient. As sales and market demands grow, more industry managers will be added for even further specialization."

Kaiser has also specialized its aluminum selling organization, and considers this a marketing development, not an abrupt departure from earlier selling techniques. This has been happening to other aluminum producers as well, such as Reynolds and Alcoa. Kaiser's direct industry approach involves four specific market outlets: (1) building products manufacturers, (2) industrial products, (3) the can industry, and (4) distributors. The field selling organization will remain the same, calling on all customers, while staff managers are responsible for the broad industry classifications.

Staff vs. Line Specialization: One major difference noted in various approaches to market orientation is the specialist's position in the selling organization. For example, several companies continue to let the line salesmen call on all industries in their areas, using the market-oriented expert as a consultant or sales developer. Heyden Chemical (division of Heyden Newport) salesmen use this method, calling on product managers for specific technical assistance.

Monsanto, however, considers the line salesmen with industry assignments the market specialists. It gives them much of the responsibility of sales development and maintenance where specialization is needed. A potential difficulty here is lack of broad enough training in all the company's products. Where this is a danger, Monsanto tries to split the salesman's time between perhaps 80% specialized sales and 20% general calls.

When the market specialist works as a staff consultant or sales developer, he sometimes runs the risk of working in conflict with the line salesman. This is especially true if communication between the two is poor. The biggest problem is possibly resentment against an "intruder" into the salesman's territory. "To avoid this, we request that product managers make calls only with the salesmen — not by themselves," says Heyden Chemical's gen-

Interested personal service always when you buy from Eastman

Eastman Ethyl Alcohol

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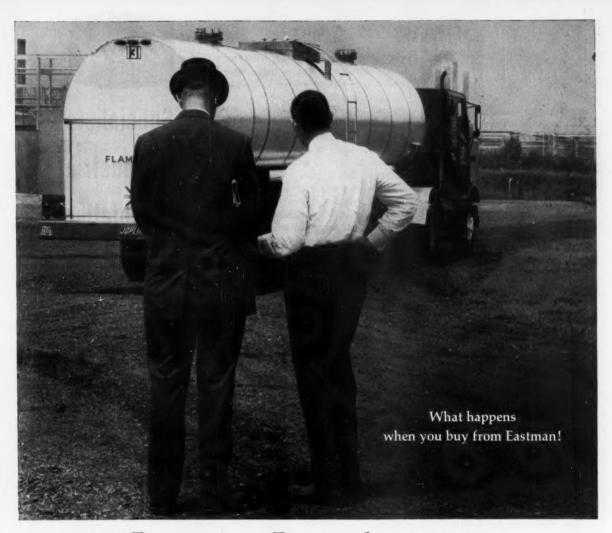
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For properties and shipping information on these and other Eastman products, see Chemical Materials Catalog, page 363, or Chemical Week Buyers' Guide, page 107.

Eastman



2B...or not 2B, was the question

"Under normal circumstances, and from a customer with all his permits in order, a telephoned request for two tank trucks of SDA-2B Ethyl Alcohol, Monday morning delivery, is a pleasant way to add impressive pounds to a salesman's monthly tally sheet," reports one of our southwestern representatives.

"But, coming as it did at 9 o'clock on a Saturday night, my chances for setting any new sales records and his chances for getting the alcohol looked pretty slim.

"I promised to try...since the cus-

tomer had to have the alcohol or shut down an important process.

"Our plant switchboard operator in Longview, Texas gave me the home number of the Superintendent of the Alcohol Department and his babysitter in turn gave me the number where I could disturb his evening out. He was a little surprised to say the least, but sympathetic as only a production man can be when I explained the short inventory position of the customer, occasioned by an unusual demand for his end product.

"I'm still not sure of how he worked

out all the details, but I do know that overtime loading crews, bonded tank trucks, drivers, etc., were rounded up and on hand Sunday morning. With an able assist from the cooperative Alcohol Tax Division the all-important shipment left Longview late Sunday afternoon and was unloading at the customer's plant at 8:00 A.M. on Monday morning."

Routine service to our customers? Not if we want to stay in business. But an idea of the type of personal, interested service that you can expect when you buy from Eastman.

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Model 515-VHV-for low to medium volume production.

Capacity-50 to 200 gallon batches. Power-10 to 15 hp.

Height-raised position, 125"; lowered position, 83".

Base dimensions-18 x 241/2".

Patented Cowles impeller with "The teeth that make the BIG difference".

MPD* (Maximum Power Delivery) variable speed transmission system, capable of delivering over 90% of motor horsepower to the impeller even at slowest speeds.

Hydraulic lift with maximum bridge rise of 42". Can be raised or lowered during operation. Full instrumentation, with built-in ammeter and

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Capacity-5 to 40 gallon batches.

Power-3 hp.

Height-raised position, 49"; lowered position, 38".

Base dimensions-16" x 23%".

Hinge mount and tilt back through 45°; hydraulic lift.

Variable speed.

Comes equipped with stainless steel Cowles impeller (including shaft) in three interchangeable sizes—4", 6" and 8". Impellers will center in containers up to 16" in diameter.

Cowles Dissolvers efficiently mix, deagglomerate, dissolve and disintegrate materials in processing solid-liquid, liquid-liquid and gas-liquid products in viscosities of up to 50,000 centipoises or more. Based on over half a century of experience in the design and engineering of dispersing equipment, they will produce more, in less space, at less cost than any other mixers of comparable size on the market. Let us prove it in your plant at our risk.

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SALES

eral sales manager, Wiliam Deakyne.

Salesman Duplicity: A major economic drawback to market specialization is the overlapping of product lines carried by different salesmen in the same geographical area. This factor was pointed out by Armour Industrial Chemical when it studied a possible shift to this type of selling.

Nonetheless, sales management there felt that increased costs could be justified by more efficient use of personnel, better sales management and promotion of increased sales volume. Armour's latest change, the split of its fatty acids derivatives sales department into petroleum chemical and industrial chemical sales, includes a 15% increase in sales manpower. Although the line salesmen will partly specialize to the extent of not overlapping each other's markets - they will be aided by a staff of specialized industry and product managers.

Product Specialists: Although many of the current sales shuffles are aimed at developing more industry-oriented salesmen, the product specialists are still much in demand. For one thing, market specialization becomes uneconomical in lightly populated areas, where sales volumes are not sufficient to support individual industry experts.

Market concentration is the biggest problem, notes Monsanto's associate marketing services director, Edmund Greene.

Other deterrents to 100% market specialization: widely diverse product lines going to the same customer, nonspecific end-uses, and ill-defined industry areas. Companies find it relatively easy to develop a specialized approach to users of plasticizers or rubber additives, or to specific industries such as pulp and paper or paint. But many general chemicals are too widespread for companies to send specialists to each user.

Forecast: The balance between product- and market-specialization is a problem with a different answer for every CPI company. The fact remains that, market volume permitting, more and more chemical producers are turning to the customer-oriented specialist salesman. And apparently this is paying off. What new twist CPI selling will take in this buvers' season, it's hard to say-but look for even more extensive shifts to market specialization as the key to the customers' accounts.



Specialists in industrial **fermentations** and fine organic syntheses

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MYANDOTT

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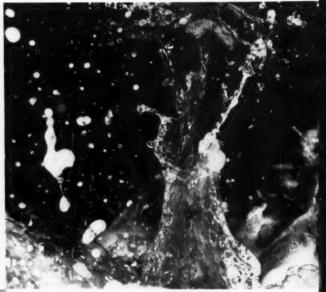
Can a Wyandotte Key Chemical help you?

We can't, of course, say with certainty . . . but the odds favor it. Others have benefited.

So, if you are a manufacturer and looking for product improvement or greater economy, let us work with you.

You may find our experience in paper, rubber, soaps, detergents, pharmaceuticals, etc., a practical assist to your profits.

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IN THE CHEMICAL INDUSTRY, Wyandotte is known not only for its high standards of quality, but for its venturesome and productive research in such new fields as polyols and alkylene oxides. Result: the chemical industry itself is our largest market.





THE PETROLEUM INDUSTRY serves you every day in some way. Wyandotte serves this industry with a special grade of CMC for drilling muds, diethylene glycol to assist in natural-gas dehydration, caustic soda for refining processes, and chlorine for countless petro-chemicals.

Growing Rubber from Propylene

In Beaumont, Tex. this week construction workers are pouring concrete foundations for a giant polyisoprene complex designed directly from the pilot plant in the photo (right). The complex, part of The Goodvear Tire & Rubber Co.'s \$20-million polybutadiene-polyisoprene plant, will be the first to use the Goodyear-Scientific Design isoprene process, a unit expected to produce polyisoprene rubber at less than 25¢/lb. SD claims that the capital investment for an integrated plant producing polyisoprene rubber by this process is half that for an integrated SBR plant.

The implications are farreaching. Polyisoprene rubber can be substituted directly for natural rubber, which has historically sold for 28-46¢/lb. Moreover, it can substitute for polybutadiene rubber, which owes half its markets to its stable price and dependable supply; low-priced polyisoprene might capture this business. And polyisoprene from the new process may cut into markets for the stereospecific rubbers; although these can be tailored to specific uses, the nature of manufacturing, say rubber makers, favors one "universal" polymer to keep costs down.

Picking the Process: All this commercial appeal is no accident. Goodyear, beginning in the mid-50's, screened 26 routes to isoprene before it found a suitable one. Among the key considerations: cheap, abundant raw materials; elimination of byproducts (e.g., acetylenic compounds) harmful to the stereoscopic polymerization catalysts.

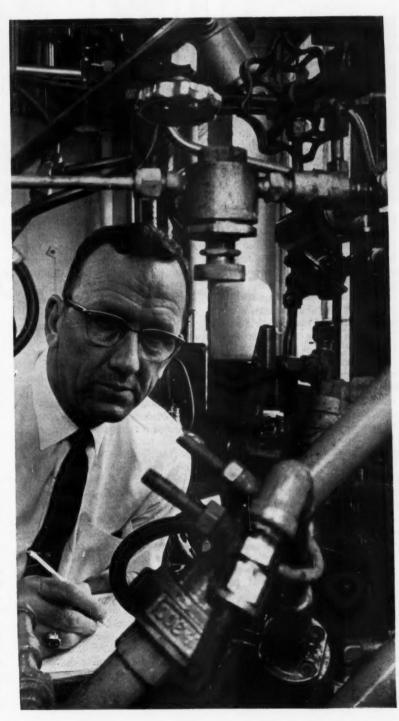
Preliminary studies soon reduced the original 26 routes to five:

Methylethylketone-formaldehyde. In this route, the four-carbon methylethylketone is combined with one-carbon formaldehyde in a condensation reaction. The resulting five-carbon hydroxyketone is hydrogenated to glycol, and the glycol dehydrated to five-carbon isoprene.

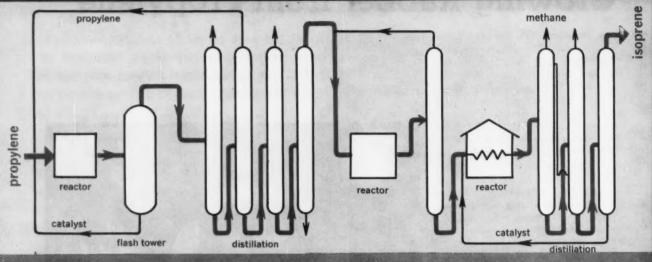
Acetone-acetylene. Two-carbon acetylene is combined with three-carbon acetone in a condensation reaction; the resulting five-carbon butynol is hydrogenated to a butenol; then the

Goodyear's Anhorn: Confident new isoprene process will survive scale-up.

A new, low-cost way to make isoprene—starting with refinery propylene—promises isoprene at "butadiene prices." It could mean strong new competition for natural rubber.



Goodyear-SD's Three-Step Route to Isoprene



1—Dimerize
Two propylene molecules are combined to make one molecule of hexylene

2—Isomerize
The double linkage between carbon atoms is shifted

3—Pyrolize
One carbon atom is cracked off to form methane and isoprene

butenol is dehydrated to isoprene.

Isobutylene - formaldehyde. Fourcarbon isobutylene is combined with two molecules of formaldehyde in a condensation reaction; the resulting six-carbon dimethyl-m-dioxane is decomposed to isoprene, formaldehyde and water. This route resembles that of the Institute Francaise du Petrole (Australian patent application 60,-453/60).

Isoamylene dehydrogenation. Fivecarbon isopentane is progressively dehydrogenated first to isoamylene (one double carbon-to-carbon linkage) and then to isoprene (two double carbonto-carbon linkages). This route resembles the one that Shell is believed to use in its isoprene process.

Propylene dimer pyrolysis. Threecarbon propylene is first combined in a dimerization reaction; the six-carbon dimer is isomerized to shift the double carbon-to-carbon linkage; and the resulting isohexene is cracked into isoprene and methane.

Cost Squeeze: Cost estimates on the polymerization leg of the polyisoprene manufacturing process showed that isoprene would have to be made for 13-15\$/lb. (or about the price of butadiene), if the final crude rubber price was to be kept below 25\$/lb.

On this count the first four routes were eliminated. The studies showed that isoprene would cost about 18¢/-

lb. from the methylethylketone-formaldehyde route, largely because of high raw-material costs; about 15¢/lb. from the acetone-acetylene route; about 15-16¢/lb. (in the U.S.) from the isobutylene-formaldehyde route; and about 15¢/lb. from the isoamylene dehydrogenation route.

The latter route showed advantages over the other three, but it was abandoned because the petroleum industry had done a lot of work on this process in connection with butadiene manufacture (CW, Oct. 29, '60, p. 39). Refiners could probably switch from butadiene to isoprene production with minor modifications, and make isoprene for almost the same price. Goodyear, in short, would not have a competitive position for cheaper isoprene.

Pyrolysis Preferred: The route through propylene dimer pyrolysis, however, appeared competitive with butadiene and was selected for intensified research. From a raw-materials standpoint it looked particularly good: it could use price-stable, abundant refinery propylene gas enriched to only 65% propylene.

Research soon uncovered a pyrolysis system that could turn out isoprene easily purified by conventional distillation methods. After it had been thoroughly proved out in the laboratory, the process was expanded di-

rectly into the design for Goodyear's Beaumont plant.

Parallel Probing: Somewhere along the line, Goodyear researchers discovered that research at Scientific Design was moving parallel to theirs. Two basic British patents on the process, issued separately to Goodyear and SD, were filed in Oct. '58 (No. 832,475) and Dec. '58 (840,028) based respectively on U.S. priorities of May 2, '58 and Dec. 2, '57.

Rather than compete, the two firms combined their efforts, hence the term "the Goodyear-SD process." SD is licensing agent for the process.

The basic patents reveal that the propylene dimer pyrolysis route cannot claim any certain thing on which the success of the over-all process hinges.

In the first step, dimerization, two propylene molecules combine to yield 2-methyl-1-pentene, with twe-carbon atoms (pentene) strung in a straight chain and the sixth (methyl) carbon branching off second from the end. Reactions similar to this have long been used by the oil industry to polymerize three or four propylene molecules into gasoline.

But these oil industry polymerizations, based on phosphoric acid catalyst, prove too inefficient when slanted toward production of propylene dimer; silica-alumina catalyst or silica

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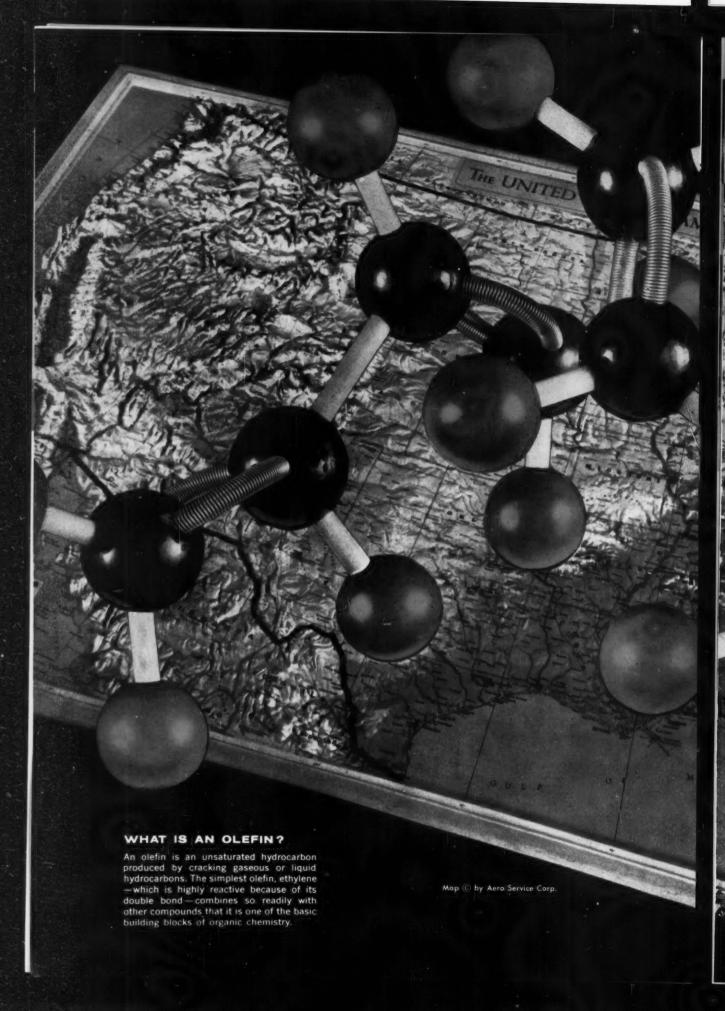
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UNION CARBIDE



Goodyear's DeYoung (left) and V.P. DuPree inspect plant model.

with molybdenum trioxide failed because they would not give the correct product. Finally, tripropylaluminum was used to give an entirely selective reaction with yields up to 95%.

Bond Budging: The resulting 2-methyl-1-pentene carries its double carbon-to-carbon linkage at the end of the chain (1-pentene), beside the branch to the methyl group. Heat "cracking" breaks this five-carbon chain down to four-carbon length. However, 1-pentene tends to break in the wrong position.

This hurdle was cleared by shifting the double linkage. The dimer, 2methyl-1-pentene, is converted into 2methyl-2-pentene in a reaction using acid-type catalysts for yields near 99% and high conversions per pass.

Pyrolysis for Product: These preliminary steps set up an ideal feed for the pyrolysis (cracking) reaction. And the discovery of a new catalyst —hydrogen bromide in an homogeneous vapor phase (French patent 1,-251,127)—brings the over-all yields well within the economic target.

Although the creation of methane during pyrolysis results in a theoretical 19% loss, this does not dim the route's economic attractiveness. Main feature of the pyrolysis step is the

elimination of acetylenic by-products. These triple-bond compounds, which result from too severe cracking, are extremely poisonous to the polymerization catalysts for making rubber, must be removed down to parts per million. In addition they are difficult to separate, must be extractively distilled from isoprene. Simple isoprene distillation by conventional methods is one of the important reasons for the propylene-dimer-pyrolysis route's low cost.

Following the Flow: The flowsheet for the process (p. 74) is extracted from the basic Goodyear patent. Fresh propylene feed is mixed with tripropyl aluminum catalyst recycled from a flash tower, and with unreacted propylene recycled from dimer distillation. The combined stream is pumped to about 3,000-lbs./sq.in. pressure, heated to about 400 F, and passed to the reactor. This resembles conventional shell-and-tube heat-exchanger design, with the propylene passing through the tubes and a coolant (to remove the exothermal heat of reaction) passing through the shell.

Reactor effluent passes directly to the flash tower, which separates the catalyst and a heavy hydrocarbon carrier as bottoms for recycle. From the

top of the tower 2-methyl-1-pentene, propylene and light hydrocarbon byproducts are sent to distillation.

Acid Isomerization: Purified 2-methyl-1-pentene is recovered as top product from the last of four distillation towers; it is heated to about 400 F; and it is passed through a fixed bed of solid acid-type catalyst. Effluent from this reaction is passed to a distillation tower where unreacted 2-methyl-1-pentene is recovered as top product; isomerized 2-methyl-2-pentene is recovered as bottoms.

Hot Road to Isoprene: The 2-pentene is passed to a surge tank, where it is mixed with recycled hydrogen bromide catalyst. The mixture is pumped into the pyrolysis furnace. Here it is heated to about 1300 F, the temperature at which the reaction takes place.

Steam, generated in the furnace's convection section, is put into the reacting stream to help control the residence time in the reaction tubes; this varies between 0.5 and 0.03 seconds. Furnace effluent is passed through demethanization, then through light hydrocarbon stripping, to isoprene purification in a final distillation tower. There, polymerization-grade isoprene is taken off as top product, and catalyst in a heavy hydrocarbon carrier is removed as bottoms.

Giant Step: These processing steps have been verified in the pilot plant (photo, p. 73). The scale-up has gone to 20,000/tons/year in Goodyear's Beaumont installation.

Exact isoprene costs will depend on this unit and on the cost of propylene, currently bracketed between 1.2 and 6¢/lb. On the other hand, the costs of polymerizing isoprene into rubber can be estimated from commercial experience. This indicates that, for Goodyear's 20,000-tons/year plant, isoprene rubber will cost 17.9¢/lb. when isoprene is 10¢/lb., 22.9¢/lb. when the material is 15¢/lb.

Meanwhile, research in the two firms continues. Latest word is that SD has come up with a different catalyst capable of replacing the tripropylaluminum in the first, dimerization, step of the process. This is deemed important to possible licensors in countries where the manufacture and handling of tripropylaluminum may offer a disadvantage.



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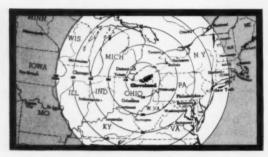


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President, The Standard Oil Company (Ohio)

Charles Spahr tells why he feels Cleveland-Northeast Ohio is better than ever

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Technology

Newsletter

CHEMICAL WEEK May 6, 1961 Another new ethylene copolymer is bidding for commercial recognition. Du Pont revealed it will make Elvax resin, a copolymer of ethylene and vinyl acetate, commercially at its planned new unit at Orange, Tex. (See also Business Newsletter, p. 33). The resin, made by a high-pressure process, is expected to be available in large quantities by year's end.

Elvax is being aimed at jobs as an additive or extender for wax and as a base for adhesives. As little as 10% in a paraffin wax, says Du Pont, improves toughness, flexibility and heat-sealing properties. If 30% or more is added, the mixture takes on characteristics of a polymer. Its big features: compatibility with a wide range of waxes, good adhesion with a variety of packaging materials. Initial price (in truckload lots) will be $55 \phi/1$ b. Because of the low cost of the wax, however, blends containing 30-40% Elvax are expected to sell for $22-27 \phi/1$ b. And Du Pont expects that the price will drop as higher volume is attained.

Du Pont's new copolymer is the third to make news within a month. The other two, however, introduced by Dow and Union Carbide are copolymers of ethylene with ethyl acrylate (CW Technology Newsletter, April 15), and exhibit properties similar to flexible vinyls.

A new nonseparating catalyst for silicones has been developed by Oxy Chemical Co. (Carteret, N.J.), will be distributed by Kramer Chemical Inc. (Fair Lawn, N.J.). It's a conventional silicone catalyst, 2,4-dichlorobenzoyl peroxide, but it's homogenized in a cream vehicle. Reportedly it does not separate, permitting better curing of solid silicone shapes.

A prototype, portable thermoelectric generator is on display in Washington this week. It was built by Minnesota Mining and Manufacturing Co., was exhibited at the National Assn. of State Civil Defense Directors. It converts heat from a kerosene flame into electricity, generates enough electricity to operate a transistor radio. It was designed as an emergency power source. The company said it will submit a production model to the Office of Defense Mobilization for test work.

Minnesota Mining, active in the field for some time, plans to build (within 18 months) prototype thermoelectric furnaces for a group of large gas companies (CW, Feb. 25, p. 92). Westinghouse is ready to design thermoelectric units to order, and a number of other firms are actively researching in the area. Several thermoelectric coolers have been made available, but they operate on the reverse principle, have a somewhat easier set of economics to deal with.

Cheops has designed a plant. Cheops (Chemical Engineering Optimization System)—a computer-based design technique (CW Tech-

Technology

Newsletter

(Continued)

nology Newsletter, Feb. 25) by Shell Chemical—was put to work on Shell Chemical's polyisoprene plant outside of Belpre, O. It marks the plant as probably the first major chemical installation in the U.S. to be designed by a computer. Says Howard E. Hughes, plant manager. "The design is more efficient than the best the engineers could have done without it. It reduced the cost of building the plant and the cost of making polyisoprene."

Japan is still a net importer of know-how. That's the conclusion from the country's official tabulations for the '60 fiscal year ended March 31. Under technical assistance tie-ups during the year, Japan received \$2,432,000, paid out \$87,629,000. As evidence of its stepped-up interest in chemical processing, however, 18.3% of the total patent applications 170,086 dealt with organic chemistry. This is double the prewar ('32-'36) average.

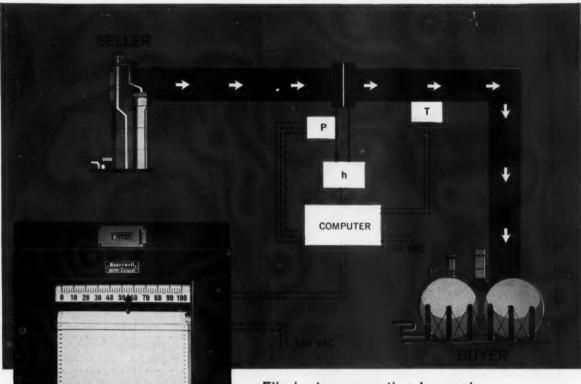
A solid form of n-butyl lithium is being introduced by Lithium Corp. of America this week. It's an homogeneous suspension in paraffin wax of 20-30% of n-butyl lithium cast as 1 in. by 5 in. sticks. The company is accepting ¼-lb. orders only, but expects to start making 2-lb. ingots at an "early date."

The compound, which is winning favor as a stereospecific catalyst, is now sold as a pyrophoric solution in a hydrocarbon. It requires special shipping containers that have to be returned. The new material is stable on moderate exposure to air, is flammable, but is not pyrophoric. It should, says LCA, offer greater convenience and safety in storage, shipping and use.

A biochemical fuel cell as a power source has been developed by Frederick D. Sisler, a biochemist with the U.S. Interior Dept's Geological Survey. The small laboratory prototype produces electrical energy directly from decomposition of organic matter created through photosynthesis and biological processes in the sea. Under natural conditions such energy is normally dissipated as heat.

A similar fuel cell has been developed by Joseph Kaye, a research organization in Cambridge, Mass. This private company is expected to receive a government grant shortly to support continued research in the area.

Russian scientists have automated champagne production—and won a medal for it, Researchers at Krasnodar Food Industry Institute worked up the method, claimed to double champagne output while cutting costs 20%. For their efforts, they received a Lenin award, a prize highly coveted in Soviet scientific circles. No details on the process have been revealed. It's described only as a "biochemical and physiological method . . . for universally acknowledged high-quality champagne."



Here's how the Honeywell gas flow computer solves a gas flow equation:

$$Q = K \sqrt{\frac{hP}{TGZ}}$$

Where Q = mass rate of flow, scfh
h = differential pressure, inches

of water

P=static pressure, psia

T=flowing temperature, $^{\circ}$ R ($^{\circ}$ F + 460)

G=specific gravity

Z = super-compressibility

K = orifice flow constant

The ElectriK Tel-O-Set $\triangle P/I$ transmitter measures h_i an absolute pressure transducer measures P_i and a resistance thermometer bulb measures T. The analog computer multiplies h by P and divides by $T\dots$ and sends a resultant millivoltage to the ElectroniK recorder. The recorder applies the correction factors G and Z, extracts the square root, and records the resultant mass flow Q.

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The gas flow computer does away with tedious, time-consuming calculations and the possibility of human error. In most applications, it will perform with accuracy of $\pm 1\%$, and, under ideal conditions, with accuracy of $\pm \frac{1}{2}\%$. You can use this new computer to measure mass flow of such gases as ammonia, hydrogen, ethylene and other hydrocarbon gases, as well as hydrochloric acid gas. And you can easily link it to telemetering and remote control systems, supervisory control, data handling, and industrial process computers. Cost of the computer in most installations runs less than \$4000.

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Chemical Newsfront



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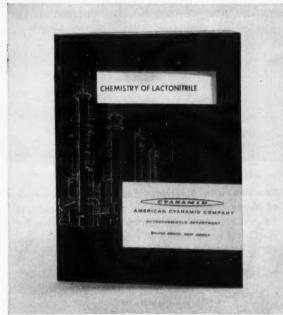
(Refinery Chemicals Deportment)





AMAZING NEW CHEMICAL CHANGES THE EARTH'S CONSISTENCY. With AM-9° Chemical Grout, Cyanamid enters the field of soil stabilization. Illustrated above, we see AM-9 transforming porous soil into impervious matter. The powdery chemical may be dissolved in water right at a construction site. Catalysts are added and the mixture is pumped into drilled holes. Result: Ground through which water cannot flow.

(Organic Chemicals Division)



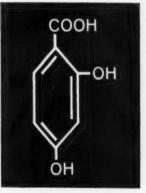
LACTONITRILE—INEXPENSIVE, BIFUNCTIONAL RAW MATERIAL. This chemical is convertible to a host of useful intermediates. Among these are lactic acid, ethyl lactate and, in combination with other products, a filler for nitrile-containing plastic materials. For the full story, send for the above booklet checking the appropriate area on the coupon.

(Petrochemicals Department)

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Productive alkylphenol reactions

Etherification with Ethylene Oxide. The length of the polyoxyethylene chain may be varied by controlling the amount of ethylene oxide used. Resulting products are widely used as nonionic surfaceactive agents.

$$R \longrightarrow OH + CH_2 - CH_2 \rightarrow R \longrightarrow (OCH_2CH_2)_nOH$$

Condensation with Aldehydes. The polymers formed are oil-soluble, soft and tacky, and not thermosetting. Alkylphenols, used with phenol, can modify the properties of ordinary phenolic resins—can improve oil solubility, water resistance, electrical resistance. Possible use: oil-soluble varnishes for electrical insulation.

$$\begin{array}{c}
OH \\
\hline
PR + HCHO \rightarrow
\end{array}$$

$$\begin{array}{c}
OH \\
\hline
PR - CH_2 - OH \\
\hline
RR - C$$

Calcium and barium salts of alkylphenol-formaldehyde polymers have been found useful as corrosion inhibitors, antioxidants, and sludge-dispersants for automotive lubricating oils.

Condensation with Sulfur Halides. Potential applications of alkaline earth metallic salts of alkylphenol/sulfur halide condensates are lubricating oil additives, rubber antioxidants, rubber vulcanization accelerators.

$$\begin{array}{c}
OH \\
+ SCI_2 \rightarrow - OH \\
R
\end{array}$$

Preparation of Phosphorus Esters. Mono-, di-, and trialkylphenyl phosphates are prepared by reaction of alkylphenol with phosphorus oxychloride. Alkylphenyl phosphites are similarly made from phosphorus trichloride. Reaction with phosphorus sulfides gives various thio- and dithiophosphate esters. Potential uses: lubricating oil additives, plasticizers for cellulose esters and ethers.

OH
$$POC^{13}$$
 $= 0$

$$PC_{l_3}$$

$$R \longrightarrow R$$

$$PC_{l_3}$$

$$R \longrightarrow R$$

$$R$$

Reaction with Aldehydes and Amines—Formation of Mannich Bases. Possible uses of the products formed are: accelerators and hardening agents for epoxy resins, printing ink additives, emulsifiers, corrosion inhibitors, pH stabilizers, dyestuffs.

$$\begin{array}{c}
OH \\
\hline
OH \\
+ HCHO + (CH_3)_2NH \rightarrow
\end{array}$$

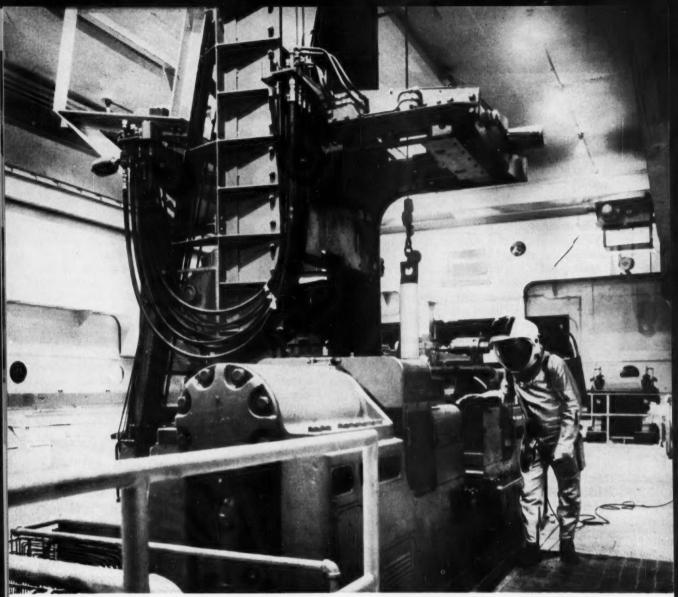


LITERATURE AND SAMPLES
Write to Dept. SP-18 for samples and
18-page booklet with more information on
reactions of alkylphenols.

ROHM HASAS



Suggested alkylphenol uses should not be understood as recommendations to violate any patents.



Operator wearing space suit fabricates refractory metals in room held under an inert atmosphere.

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SPECIAL REPORT



One big need for refractory metals . .

NGINEERS in a number of industries have unwittingly discovered that hot (2000 F and above) air is close to being the universal solvent. To the chemical industry falls the task of developing a package for it. At the moment, there are two likely container materials: columbium and tantalum. Whether they do the job, or can be modified to do it, is still to be determined. In any case, the challenge is fearsome, but the rewards are commensurate with it. Here's why:

Making and selling primary columbium and tantalum is at least a \$15-million business now. And there are a number of applications in aircraft and rockets that are eagerly waiting better alloys and coatings. In such jobs, cost would not be the primary consideration. But success in those fields would provide the needed technology and volume of production that would drive costs down and open up new markets.

At what point this chain would terminate is an open question. Tantalum production could probably triple in five years; eventually it might increase 10-fold. Further growth would be restricted by the amount of suitable ores.

Columbium is much more abundant, and estimates of its growth rate vary within broad limits. Charles Hunt, of Temescal Metallurgical, who has looked at the market in relationship to selling price (CW Technology Newsletter, April 5, '58), feels that if the selling price of mill products drops to \$5/lb., the market would be 9 to 45 million lbs./year; at \$4/lb., 20-100 million lbs./year. Events recently have served to reinforce his views.

Max Hirsch, president of Molybdenum Corp., feels that, in the reasonably near future, columbium's price may drop to the \$3-10/lb. level. K. C. Li, Jr., chairman of Wah Chang, sees no reason why mill products can't sell for \$5/lb. when volume reaches 20-30 million lbs./year. Eventually, he feels, columbium mill products should be competitive with special stainless-steel mill products that cost \$2-3/lb.

In any event industry people are thinking big about columbium. D. H. Barbour, head of a newly formed department at Union Carbide Metals charged with commercializing such refractory metals, would "love to see someone using a columbium plow." He means that while the defense market is the immediate, and possibly glamorous one, he is interested in finding some large volume—if pedestrian—uses over the long range. "We're confident this will grow," he says. "But there are just too many 'ifs' right now to make any sort of a reliable prediction."

William De Long, sales supervisor of columbium products for Du Pont's Pigments Dept., is similarly confident, similarly reluctant to make any predictions.

Time was, engineers designed new systems around

the materials at hand. As better ones came along designers drew new systems or modified older ones to take advantage of superior properties.

Such an orderly evolution is just not practical in the current race to build better rockets and planes. For example, there is right now an urgent need for materials that can retain their strength at 2000 F, which is about 200 F higher than the serviceable limit of superalloys cobalt and nickel, the best materials now available.

In seeking a material suitable for use at higher temperatures, researchers first apply the rule of thumb that the useful service temperature for any material is 0.6 of its melting point. In other words, they're interested in those that have a melting point of over 3000 F.

There's no lack of such compounds. Battelle researchers have tabulated 122 that melt at over 3272 F (1800 C). But engineers prefer metals (to refractory compounds) because of their ductility; and the list contains 18 metals or metalloids that melt at above 3000 F (see chart, p. 93). Of those, 14 seem unsuited for any but specialized application because of ore scarcity, disappointing high-temperature performance or other reasons.

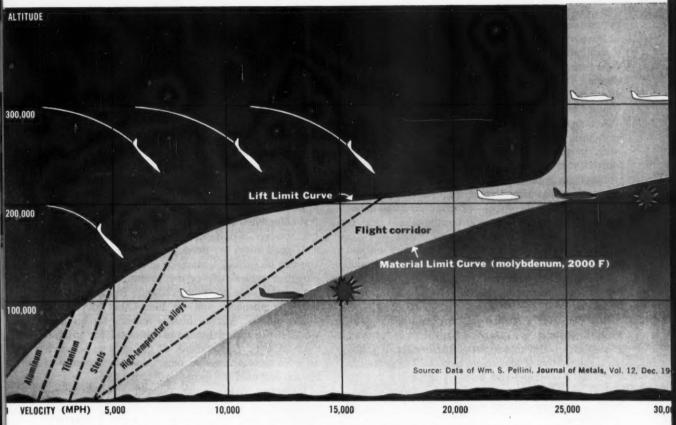
Of the remaining four metals columbium and molybdenum will compete in applications between 1800 and 3000 F; tantalum and tungsten for applications over 3000 F. Making a choice between them is far from easy, but at the moment columbium and tantalum, Group V metals, seem to have the inside track over molybdenum and tungsten, their Group VI neighbors.

In the unalloyed state, molybdenum is stronger than columbium and has a higher melting point. But it is difficult to work. More important, in the presence of oxygen at temperatures above 1000 F, it forms a volatile oxide. That calls for a protective coating if the metal is to be exposed to a hot oxidizing atmosphere and is not allowed to "boil away." Considerable time and effort has been spent on development of such a coating. Although progress has been made, the prospects of finding a material that will be completely satisfactory seem dim. The big difficulty is that if even a pinhole develops the metal oxidizes "catastrophically." In general, tungsten has the same strong points—and shortcomings—as molybdenum.

Shades of Gray: The process of elimination outlined above is not black-and-white, by any means, however. For instance, carbon lacks ductility and oxidation resistance. But pyrolytic graphite, formed by the thermal dissociation of hydrocarbons, has won friends and influenced aircraft design engineers. Intrigued by its high melting point, they're trying to design around its limitations.

Similarly, molybdenum is due for a number of jobs. It's being groomed for most of the glider structure in

enable faster light at lower altitudes



Flight corridor is defined by two curves. Planes must fly at a minimum speed to maintain altitude. But if they fly too fast, structural materials will heat up, eventually disintegrate.

the Air Force's Dyna-Soar project. All areas that will be subject to high temperatures will reportedly employ coated molybdenum. It's also the likely material now for the Air Force's projected successor to the Dyna-Soar, the "Space Plane."

And for really extreme temperatures, tungsten will get the nod over tantalum because of its higher melting point.

All these things considered, however, columbium and tantalum still seem to have the edge, as indicated. The point is underscored by reports that columbium is being used in a "backup" contract for the Dyna-Soar.

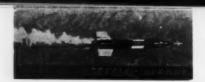
Plus and Minus: It's easy to make a case for columbium as a "wonder" metal: it is abundant, loses strength slowly as it is heated, is comparatively light, easily fabricated and has good neutron properties.

But actually, like titanium and earlier candidates for the title, columbium is anything but a "wonder" metal. It is, in fact, not particularly strong at room temperatures. It has corrosion resistance almost as good as tantalum, but, again like tantalum, it won't win any prizes for its resistance to high-temperature oxidation. Its saving grace is that its oxide is not volatile. Thus the metal does not oxidize "catastrophically" (this is true too of tantalum).

Moreover, both strength and oxidation resistance of columbium can be significantly improved by alloying. Trouble here is that the ingredients that are best for strengthening (tungsten, molybdenum, zirconium) are different from those that are best for improving oxidation resistance (aluminum, titanium, chromium).

Considerable work on alloying has been done by firms such as General Electric, Du Pont, Carbide Metals and Wah Chang. And while progress is being made, there has to be some compromise on strength, oxidation resistance, or workability. This, of course, is true for any alloy program.

Hot Jacket: The coating problem is being attacked from several directions. The Office of Naval Research has developed a dip-coating of zinc that is promising. It is self-healing, will protect columbium for short periods up to 2000 F, but 1800 F is a more realistic



Box score on other refractory materials

upper limit. That's far short of target, but the Navy is optimistically continuing this line of work.

The government is supporting research on coatings in a multitude of labs. Labs and companies working on the problem: General Electric, Batelle, Sylvania Corning, Fansteel, Marquardt, Thompson-Ramo-Wooldrige, Boeing, Chromalloy, Chance Vought, Pfaudler Union Carbide and Du Pont.

Although most areas of research of these firms are hush-hush, Fansteel has some well-known patents covering, in general, silicides of molybdenum coatings. Molybdenum disilicide, already used for molybdenum, typifies these promising materials. The firm says that it has coatings that protect columbium for "thousands of hours" at high temperatures—provided the metal is not subject to stress. If it is, the coating cracks and is useless.

Titanium silicides and a variety of ceramics are also being studied, as are alloys of chromium, aluminum and silicon. Different means of applying the coating are being tried, too, ranging from dipping to vapor deposition.

In some cases a coating will not be necessary—as when the material is expendable or is used in reducing atmospheres (as in rocket nozzles). However, it seems fairly evident that if columbium is to fulfill its potential, a coating is crucial—and probably a variety will be needed to meet the requirement of different alloys. Plainly, alloy and coatings programs should be closely coordinated.

PROSPECTS FOR COLUMBIUM

Columbium has already posted a fairly impressive growth record. Production in '58 came to 60,000 lbs., according to the Bureau of Mines. The Bureau no longer reports absolute figures since one company (Wah Chang) dominates production of primary metal. But in '59 output probably amounted to 130,000 lbs.; in '60, 200,000 lbs.

The growth, however, is somewhat illusory. By far the biggest user of columbium now (taking 70% or more of the total) is Pratt & Whitney, for its CANEL (Connecticut Aircraft Nuclear Engine Laboratory) project, the indirect-cycle nuclear aircraft engine. The demand was expected to taper off as prototype work neared completion. But the curtailment of the government's programs on nuclear aircraft may result in a drop more drastic than anticipated.

But columbium has much to recommend it for many nuclear applications—as a cladding agent, an alloying element (with fuel) or a material of construction. In addition to its strength at high temperatures, it is permeable to thermal neutrons, corrosion resistant, stands up to many of molten metals, good heat-exchanger.

Columbium is now used in the Experimental Boiling-Water Reactor and as a cladding agent at the Dounreay (Scotland) reactor. Battelle, for one, has studied a columbium alloy containing 20% uranium as a fuel. The alloy exhibited excellent strengths at temperatures of approximately 1600 F, whereas currently used fuel elements fail at 1200 F. In compact or gas-cooled reactors, where higher operating temperatures are desirable, a material like that can be a big help.

Moreover, the metal and its alloys are being researched for finned-tube heat exchangers not only in atomic energy applications but also in solar heating and thermoelectric devices.

General Electric and Pratt & Whitney use columbium in aircraft turbine work. But what it boils down to is that columbium doesn't have a single, solid market. It has, however, high hopes for a great many.

If good alloys are developed and the coating problem can be solved, columbium could find gainful employment immediately in the construction of aircraft wing sections (e.g., leading edges), rocket nose and nozzle components, and the like. Other jobs would follow quickly. Aircraft turbine makers, for instance, would like a material that can withstand hot gases at 2000-2500 F. The demands of the turbine, however, are even more severe than others, include resistance to erosion and need for exceptionally long life.

Stationary power turbines could end up as big consumers of columbium—such units stand to gain higher operating temperatures and hence greater efficiencies by use of it.

The biggest hope of all, however, is in the automotive turbine, which is expected to operate at 2150 F. Considerable development and testing is now being done on automotive turbine engines, and a number of groups are involved. Some feel that it is just a matter of time before they'll be production line items, but nobody in the columbium business seems to be banking on that.

There's a potential for columbium, too, as a competitor for tantalum in capacitors and as a corrosion-resistant material for chemical processing. Tantalum has captured the miniaturized capacitor market because of its stable anodic oxide film, which is strong and has a high dielectric constant (insulating value). Capacitance is directly proportional to the area of the metal, inversely proportional to film thickness. Consequently, tantalum is favored (over aluminum) is electronic devices where reliability, miniaturization and tolerance for temperature fluctuations are more important than cost.

Columbium has electronic properties similar to tantalum's; but because it is only half as dense and because capacitance is a function of area rather than

-how they are set up for ores, prospects, producers

Metal (Ore Reserves	Current Status	Producers
CHROMIUM	Chromium is the most abundant of the refractory metals. Total reserves amount to well over 500 million short tons of metal. Principal deposits are in the Transvaal district of the Union of South Africa, Southern Rhodesia, Turkey and the Philippines. There are reserves in the U.S., but under present conditions, they are uneconomic to work. There is more than enough metal available to support a 20-million-lbs./year industry.	Consumption of chromium ore in the U.S. (about 1.2 million short tons in '60) is mostly for ferroalloys in stainless steel and refractories. Production of chromium chemicals takes approximately 10%. Production of high-purity, ductile chromium is negligible.	Metal & Thermit Corp., Shieldalloy Corp., Ferro Metals and Chemicals Co., Union Carbide Metals Co., Lunex Co., Chromalloy Corp., Manganese Chemical Corp., Du Pont, Kawecki Chemical Co.
MOLYBDENUM	Estimated reserves in the Western world are 2,850,000 short tons of contained molybdenum, 600,000 tons of which are economically recoverable only at high metal prices. Some 90% of current production of molybdenum ores is within the U.S. Climax's mine in Colorado accounts for half of this; the other half is a byproduct of copper mining. Explorations at Molybdenum Corp.'s Questa holding, closed since '56, indicate new reserves there of 380,000 tons.	Production of molybdenum in all forms in '60 came to more than 68 million lbs. Only a fraction of this, however – 2.5 million lbs. in '59 – is used for metal. Some 80-90% of all molybdenum used in the past has been for ferroalloys.	Climax Molybdenum Co., Fansteel Metallurgical Corp., General Electric Co., Molybdenum Corp. of America, Sylvania Electric Products, Wah Chang Corp.
TUNGSTEN	U.S. reserves of tungsten are estimated at 143 million lbs. (9 million units of WO ₃). In the rest of the Western world, there are probably about 444 million lbs. Large deposits exist in Iron Curtain countries.	Consumption of tungsten in the U.S. in all forms during the first nine months of '59 was 9,124,000 lbs. Most of this was for use in alloys (mainly steel) and carbides. Some 18% went into wire, rod, sheet or forging billets.	Cleveland Tungsten, Inc. (Molybdenum Corp.), Fansteel Metallurgical Corp., General Electric, Molybdenum Corp., Sylvania Electric Products, Union Carbide Metals, Wah Chang Corp., Westinghouse Electric.
RHENIUM	Rhenium occurs in small quantities in some molybdites. Main sources in the U.S. are flue dusts of Miami Copper Co. in Arizona and of Kennecott Copper Corp. Total reserves in Western countries are probably not much over 1,000 tons, enough to support production of 10 tons/year.	Capacity for rhenium is now approximately 1 ton/year, and that is more than demand. Upper limit for rhenium output: probably 10 tons/year.	Chase Brass & Copper, Chemistry Dept. of University of Tennessee.
RIDIUM OSMIUM RHODIUM RUTHENIUM	Total Western world reserves of platinum group metal is not much over 600 tons. About half of this is in South Africa, which supplies about 60% of the metal. The rest comes from by-product nickel production in Canada and as a by-product of gold mining in South Africa.	Western countries' production of the platinum family is approximately 30 tons/year. Opportunities for expanding this seem remote.	J. Bishop & Co., Engelhard Industries, Johnson Matthey & Co., International Nickel, Baker and Co., American Platinum Works.
VANADIUM	Reserves of vanadium are estimated at over 1 million tons, two-thirds of which are in the U.S., where it is found in carnotite and roscoelite in association with uranium. Important reserves outside the U.S. are in Finland and the Union of South Africa (in titaniferous ore) and in Southwest Africa (in lead vanadates).	Consumption of vanadium last year was estimated at 2,136 tons. Most of this (1,603 tons) went to ferrovanadium for steel. Production of the metal itself is insignificant now. Ore reserves are sufficient to support a 10-12,000-tons/year industry.	Oregon Metallurgical Corp., Shield- alloy Corp., Union Carbide Metals Co., Vanadium Corp.



weight, a pound of columbium would go twice as far as a similar quantity of tantalum. In addition, columbium is potentially much cheaper on a weight basis. Carbide, General Electric and the government have all done work on columbium capacitors. The question is whether the same high degree of reliability as is in tantalum capacitors can be built into the columbium equipment. And some are convinced that columbium's electronic properties are inferior to tantalum's and that twice as much columbium is required to make a capacitor equivalent to a tantalum one.

In corrosion resistance, columbium is not quite as good as tantalum. However, a number of purchasers would happily settle for it—if the cost can be brought down. Producers hope that eventually it can compete not only with tantalum but also with titanium and the stainless steels.

The superconductivity of columbium affords some intriguing possibilities. The phenomenon of superconductivity (i.e., the loss of all electrical resistance at temperatures close to absolute zero) has excited scientists for over 50 years. A number of obstacles have prevented any practical use of it—the ability to get and hold the necessary low temperatures, for instance. But research in the field is now at white heat and monumental strides are being made.

For example, engineers are eager to construct an electromagnet of superconducting material because once the field is established it would require no loss of energy to maintain it. Among suggested applications: a magnetic bottle to contain the plasma in controlled nuclear fusion power generation.

At present a large portion of the power produced by such a scheme would be required for the magnetic containment. A superconductor, on the other hand, would require only negligible power quantities—to provide refrigeration to maintain the low temperature.

Closer to Commercial: Likely to affect columbium markets much sooner is the metal's increased use in ferroalloys. Ferrocolumbium, produced by the silicon reduction of ore in electric furnaces, has long been used in stainless steels to prevent carbide precipitation in the 800-1600 F range. Containing approximately equal amounts of columbium and iron, this additive material now accounts for approximately 600,000 lbs./year of columbium and seems assured of at least a modest growth.

Now there are indications that small amounts of columbium can work wonders for carbon steel too. From 0.5 to 2 lbs. of columbium (as the ferroalloy) added to a ton of steel has shown ability to hike tensile and yield strengths significantly. It permits the reduction of a fine-grained (therefore stronger) steel

Among 18 refractory elements . .

without completely "killing" it (deoxidizing with an additive such as silicon). This provides a saving, since completely killed steel shrinks greatly in ingot molds unless cost-adding measures (so-called "hot topping") are taken. By a mechanism that's not fully understood, small amounts of columbium improve the grain without completely killing the steel, eliminate the need for hot tops.

The resulting steel also has superior strength and fabrication properties—e.g., it can be used to make small and lightweight (32 oz.) containers that hold a 20-gal. (1 hour) supply of oxygen for medical uses. Similar weight savings might be helpful for trucks; and the steel's high strength and workability qualify it for pipelines because it can be welded readily—even at subzero temperatures.

Great Lakes Steel has done extensive work on columbium-treated steel and has been advertising it for some time. Republic, among others, is believed interested. But so far the development has not succeeded in moving appreciable amounts of ferrocolumbium.

PROSPECTS FOR TANTALUM

Tantalum does not have the growth potential of columbium. What it does have that columbium doesn't are several bread-and-butter markets. Production of primary forms of tantalum last year was probably 250,000 lbs. Technical-grade powder sells for \$30-40/lb.; capacitor grade, \$47.50-50/lb. Ingots sell for approximately \$45/lb.; mill products for \$50-80/lb.

The market breaks down into four broad categories. Here's what they are and how they figure to grow:

- Capacitors and capacitor components now account for slightly more than 50% of the total market. This field has been growing at a rate of 10-15%/year; this rate will likely continue, may easily improve. One possible stimulus: accelerated space effort, which would hike demand for the rugged, reliable tantalum capacitors.
- Electronic parts, such as plates in electron tubes, now take 20-25% of the tantalum produced. There's probably not much growth in this, however. Reason: when engineers design a new tube or part, they start off with the best material, then begin experimenting to find a cheaper one that will accomplish the same thing. It's likely that the tantalum market in this application has reached the steady state, losing markets to substitutes as fast as it's gaining new ones.
- Chemical process equipment accounts for 25-30% of the tantalum market, and has been gaining in this area at about 5%/year. Usage here will probably continue to grow, but no real spurt is foreseen.
 - High-temperature alloys now employ only 5% of

stating the case for columbium and tantalum

iroup	Element, melting point (F)		COLUMN TO THE RESERVE
IV	CARBON (6400-)	lacks ductility	Dyna-Soar typifies the projects de- manding new refractory materials
ın	BORON (6170)	(Inches)	
=	RHENIUM (5750) OSMIUM (4900) IRIDIUM (4500) RUTHENIUM (4300) RHODIUM (3600) PLATINUM (3300)	scarce	U.S. AIR FORCE
	TANTALUM (5440) COLUMBIUM (4480)	BEST BETS	
	VANADIUM (3450)	poor oxidation resistance	
が記述を	TUNGSTEN (6170) MOLYBDENUM (4730) CHROMIUM (3430)	hard to work, subject to catastrophic oxidation brittle, subject to nitrogen embrittlement	
The state of the state of	HAFNIUM (3900) ZIRCONIUM (3400) TITANIUM (3140)	unsatisfactory high- temperature performance	
de	THORIUM (3150)		



the tantalum that's made. (An alloy of tantalum and 10% tungsten, for example, is now used in the Polaris rocket nozzles.) Its future is analagous to columbium's for similar jobs. Alloying could take 50% of the total tantalum market in 5-10 years.

Doubling Plus: The outlook then is that tantalum production will at least double, probably triple within five years.

Declares Fansteel President Frank H. Driggs: "The space market is the big question. But, on balance, we feel that the market will triple in the next five years." James H. Gardner, general manager of the Metals Division of National Research and corporate vice-president, feels it will probably do more than triple.

HOW MUCH ORE?

Columbium and tantalum are always found together in nature but the proportions of the two vary within broad limits. If tantalum predominates, the ore is known as tantalite; if columbium, columbite. Recent estimates are that columbium is approximately 13 times more abundant than tantalum—but this estimate was made before new discoveries of pyrochlore, a complex oxide in which the columbium-tantalum ratio is 20:1 and higher, could be figured in.

Tantalite/columbite ores occur in many parts of the world. Historically, the most important sources have been in Nigeria, the Congo and Malaya. Many columbites occur in association with tin, and slag from certain tin smelters has been a significant raw material.

Because of the disparity in their abundance, the best way to understand their potentials is by taking a quick look at the ore reserves for each:

• Tantalum. Tantalite is sold on tantalum oxide content; any columbium present can be considered a bonus. Early last year, it was selling for \$4.80/lb. of contained oxide. Trouble in the Congo, however, pushed prices upwards and ores are now selling for \$7-7.50/lb. or higher.

There is some disagreement on the ultimate reserves of tantalum. A study for the National Academy of Sciences showed they were sufficient to support a production of approximately 600 tons/year. Some industry people feel this is conservative. Fansteel's Driggs leans to a range of 600 tons minimum to 1,000 tons maximum. He points out, however, that these figures are predicated on known reserves and do not take into account the possibility of new finds.

The exploration effort for tantalum is, of course, related to the market price/demand; in any case, the likelihood of any discoveries to appreciably alter the present outlook is not great though: Ore prices will continue to go up; production will not be able to sur-

pass 2 million lbs./year; there will be no dramatic reductions in metal costs.

• Columbium. Columbium ore is sold on combined columbium/tantalum oxide content. The price varies with the ratio of columbium to tantalum but the range is \$1.05-1.25/lb. of contained oxide.

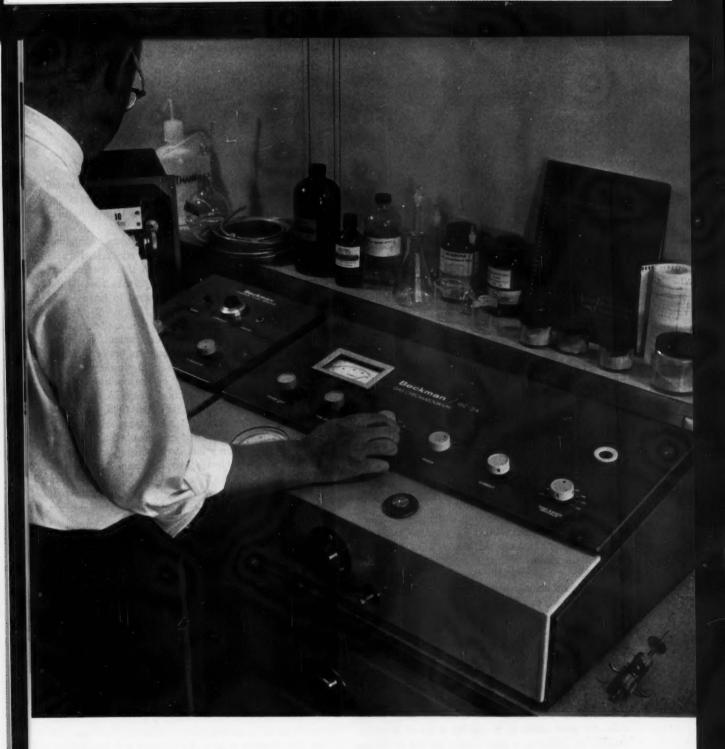
Reserves of columbite in the Congo and Nigeria have been placed at 70,000 short tons of contained metal. Discovery of pyrochlore, however, in Brazil, Canada, the U.S. and elsewhere boost total reserves a hundredfold

Pyrochlore varies in columbium values and there is some question concerning the economics of using it. The Brazilian find, near Araxa, generally considered to be the world's biggest source of columbium metal, is unusually high grade, runs 3.5-4% columbium. Wah Chang (with Molybdenum Corp.) has the concession for developing it. One hurdle: the ore also contains thorium and the Brazilian government is not willing to give up any fissionable material. However, it is thought ready to allow use of the ore so long as the thorium is returned. In fact, indications are that an agreement has been reached and the reserve will be tapped shortly.

The ore in Canada (in the Oka district) is considerably poorer, running 0.3-0.7% columbium. But several companies are reported near commercial production. Nova Beaucage Mines is awaiting an improvement in the market before it goes ahead with plans. But St. Lawrence Columbium and Metals Corp. reports it is proceeding with a concentrating unit at Annunciation du Lac, Two Mountains, Quebec. It plans to start operations in August, producing 500 tons of concentrate containing 4.5-5% of columbium pentoxide daily. The concentrate will be sold to Samincorp of New York under an agreement reached last summer. Molybdenum Corp., in association with Kennecott, has substantial interests in the Oka deposit too, and Kennecott has done considerable work in developing economic ways of concentrating it.

Columbite has been mined in the U.S., primarily by Porter Bros., Bear Valley, Ida. (in conjunction with euxenite) under a government contract. But the contract expired in '59 and there has been no domestic production since. Du Pont, however, has purchased rights to a pyrochlore deposit at Powderhorn, Colo., which holds an estimated 70,000 tons of metal.

In the sum, outlook for columbium based on its ore reserves is favorable. The metal is approximately as abundant as nickel, one-third as abundant as copper. If metal demand climbs sufficiently, lower-grade ores will have to be exploited, at somewhat higher ore cost. However, this should be easily offset by economies of large scale production, possibly improved process-



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ing technology. The net result should be a sharp drop in price for metal.

PROCESSING TRENDS

The production of columbium and tantalum breaks down into three stages: separation of the two metals; reduction to primary metal; casting and fabrication. Normally, casting and fabrication would not fall within the purview of chemical processing. The job is highly specialized, however, and, in addition, is closely related to the process used to make the primary metal.

Separation: The classic method for separating columbium and tantalum is the Marignac process. Progressive crystallizations turn out potassium fluotantalate crystals and a solution of potassium fluocolumbate. This method, however, has largely given way to a solvent extraction process developed by the Bureau of Mines.

The bureau's technique is based on differences in solubility of the two fluorides in methyl isobutyl ketone at different acidities. An ore concentrate is digested in hydrofluoric acid, converting the metal pentoxides to fluorides and leaving a gangue containing most of the impurities. When the aqueous, acidic solution is brought into contact with MIK, the tantalum is taken up in the organic layer at low acidity; the columbium at higher acidity. Most of the other metals (titanium, zirconium, iron) remain in the aqueous phase. The two metals are separately precipitated as hydrated oxides by addition of ammonia, then calcined to the oxide. Or, they can be converted to double fluorides by addition of potassium fluoride.

There are a number of other methods for separating the metals. Ion exchange can be employed to get a truly sharp separation. But most producers consider this as too expensive for commercial production.

Fractional distillation (or condensation) of the chlorides now seems to be getting a lot of attention. Stauffer is operating a plant based on the technique; Du Pont is thought to be using it. Battelle and the Bureau of Mines have worked on it. Ciba has done considerable work in the field and others (e.g., Kennecott, Dow and Diamond Alkali) are believed to have more than an academic interest in it.

Reduction to Metal: There are also a number of methods of reducing the metallic oxide or halide to metal. One method: tantalum powder is produced by the electrolysis of the double fluoride. Solidified cylinders (roundels) are made by reducing the pentoxide with carbon. Actually, this is done in two stages: the oxide is reduced with carbon to tantalum carbide, which acts as the reducing agent in producing metal

from more pentoxide. The roundels can be converted to powder by treating with hydrogen to form the metal hydride, then crushing and dehydriding at elevated temperatures under vacuum.

Sodium reduction is also used to produce tantalum. The double fluoride and sodium are sealed in a "bomb" and heated sufficiently so that the reaction goes forward violently. The bomb is then cooled, and the mixture of salt and metal leached to leave a fine metal powder.

A carbon reduction, similar to that used for tantalum, is now the major route to columbium. But other processes, which may lend themselves better to large-scale processing are getting careful scrutiny: reduction of halides with sodium or magnesium or with hydrogen. Right now, reduction of the pentachloride with hydrogen is causing a stir. Du Pont is thought to use it. Stauffer developed a hydrogen reduction for titanium which can be used on columbium. And Battelle has reported on a fluidized hydrogen reduction of columbium pentachloride, developed for Nova Beaucage Mines.

In the Battelle method, finely ground columbium serves as the fluid bed. Columbium pentachloride vapors are reduced with hydrogen to metal which deposits on fluidized particles acting as a seed. The bed is periodically replenished by grinding some product. The process, says Battelle, is capable of producing exceptionally pure columbium—containing less than 500 parts per million impurities.

Casting: There are three basic methods now used to convert the two metals into more useful shape: powder metallurgy; vacuum arc casting, and electron beam melting.

In the first, ingots are formed by hydraulic pressure, then sintered in a furnace under vacuum (or inert gas). In arc casting, developed for titanium, molybdenum and other metals within the last decade, partially sintered metal is hydraulically pressed into ingots, which serve as consumable electrodes. They are fed into the furnace, held under vacuum and melted into a water-cooled copper crucible. Ingots so produced can be used in a second furnace to make bigger, purer ingots. Also, vacuum arc casting can be done in a non-consumable electrode cold-hearth arc-melting furnace.

In electron beam melting, an electron gun focuses a beam of electrons on the metal which is held under high-vacuum. The metal melts and drips into a water-cooled copper mold while impurities that are volatile under the conditions are pulled off by the vacuum.

The electron beam does nothing for some metals (such as titanium) because the metal itself is pulled off in preference to the impurities. It's eminently well suited for columbium, however, because columbium



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monoxide and nitrogen evaporate rapidly in high vacuum while the metal evaporates slowly. So the electron beam affords a method of consolidation into ingot and, at the same time, produces a metal of high, consistent purity. It is useful, moreover, in reprocessing scrap.

At the same time, it has limitations. Many consider it an expensive step (although electron beam supporters dispute this vigorously). Possibly even more important, it is useless in casting oxidation-resistant alloys containing titanium, chromium, vanadium and aluminum—the alloying metal boils out of columbium rapidly.

Wah Chang uses a double electron beam processing and its metal is setting the standard for commercial production. It is doubtful that many other producers can match this without an electron beam furnace. Du Pont, however, produces the highest purity material available and sells it for \$55/lb., \$20/lb. over the going market price. It is convinced that with careful chemical processing, the electron beam is not necessary either for casting ingots or scrap reprocessing.

The question concerning the place of the electron beam in columbium production is plainly complex. It is somewhat dependent on what the favored alloys will be. Moreover, not enough is known about the effects of various impurities on metal properties. The present approach is to make the purest metal possible.

Fabrication: Both tantalum and columbium are readily workable and fabrication into mill products presents few problems. But some of the alloys are harder to work with. And in all cases some specialized techniques are called for.

Initial breakdown of ingots will probably be done "hot"; hot extrusion will probably be used extensively. This will call for some high temperatures, over 2,700 F for columbium, for example. And since the metal has an affinity for oxygen at those temperatures, care must be taken to prevent contamination. This can be done by the now-conventional method of "canning" with subsequent lubrication with salts or glasses.

An important experiment in the fabrication of refractory metals is being carried out by Universal Cyclops Steel Co., under a contract with the Navy Bureau of Aeronautics. The fabrication is carried out in an "Infab" room, one maintained under an inert atmosphere. Operators wear "space suits" when converting arc cast ingots into sheet. The experiment is significant and is being watched with great interest. Universal Cyclops is optimistic on costs, but others shudder at the idea of a commercial infab room.

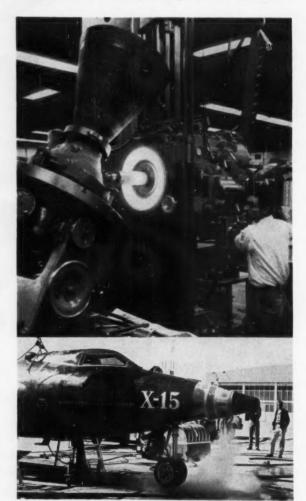
Speedy, high-flying X-15 is focusing on need for improved refractory metals.

Du Pont considers the fabrication problem critical enough to spend \$12 million on a new facility in Baltimore now producing columbium mill products.

WHO'S WHO

One of the imponderables now is the question of optimum plant size. Industry experts confess that they just don't know enough to make a good guess now. By the same token, it's clear that cheap metal can only be produced via large-scale processing. And even the most optimistic market estimates do not allow for large-scale production by the number of firms now active in the field. Temescal's Hunt, in measuring price vs. markets, divides the market by three "to allow for three major producers of the same size."

He doesn't mean that three is any sort of magic number; he means merely that the market can best be served by a few large producers. It isn't possible to predict what firms will become dominant. It is possible, though, to look at the present producers, assess their

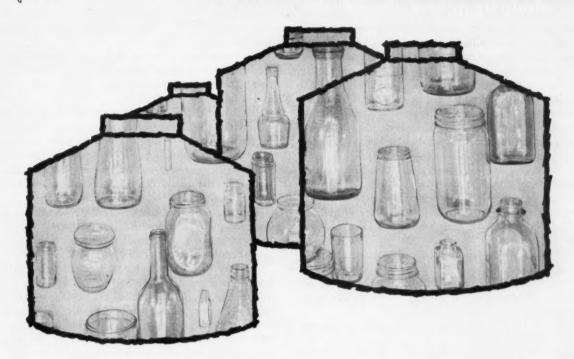


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present positions and, broadly, their potential strengths:

Fansteel. The pioneer commercial producer of tantalum and still one of the two principal producers of the metal, Fansteel is a firm to reckon with in columbium as well. It has two plants, the original unit in North Chicago and a newer one at Muskogee, Okla., which have a combined capacity of 300,000 lbs./year for tantalum and 75,000 lbs./year for columbium. Its recent expansions have been at Muskogee and the indications are that this is now the firm's major facility, the North Chicago operation being a secondary one.

Fansteel buys ores (mainly from Africa and Brazil at the moment) but it is completely integrated from that point to mill products. It separates the metals by solvent extraction, using a modified Bureau of Mines process. It uses an electrolytic reduction to produce tantalum powder, then arc-casts ingots or employs powder metallurgy techniques, depending upon end use.

Kawecki Chemical. Kawecki is the other principal producer of tantalum. Its capacity is difficult to gauge. It is thought to have doubled its original plant at Boyertown, Pa. That would give it a capability of at least 100,000 lbs./year of both metals, but mostly columbium.

It's believed to separate the two by solvent extraction, produce primary metal by sodium reduction. Its separation facilities probably cannot support all its reduction capacity and it is thought to have bought some double fluorides from Mallinckrodt.

Wah Chang. Wah Chang produces both metals, but its forte is columbium. Its plant at Albany, Ore., has been boosted to a point where it can now make 480,000 lbs. of columbium and 120,000 lbs. of tantalum annually. It has important ore connections, and with its participation in the exploitation of Brazilian pyrochlore deposits, it is in an enviable position. For separating the two metals, it uses a modification of the Bureau of Mines solvent extraction. It now reduces with carbon, but is studying a sodium reduction.

Wah Chang got off to a flying start in columbium, was first to use an electron-beam furnace as a production line tool. It now owns three such furnaces, each of which can handle 500-800 lbs./day. In view of its solid ore position, and present dominance in columbium production, it is apt to prove tough to dislodge.

Union Carbide Metals. UCC has been primarily identified with tantalum, but it is making a major effort in columbium, too. Its plant, at Niagara Falls, N.Y., can annually make over 50,000 lbs. of either metal. But it could quadruple capacity with little effort and is willing to "go as big as we have to." Its ore position is good for the immediate future. Thanks to its tantalum production, it has amassed a considerable columbium stockpile. It is known to have investigated Brazilian pyro-

chlore (as has Du Pont) and could well end up with a good long term ore position too.

UCC employs solvent extraction for separation, then carbon reduction, although it does some electrolytic reduction too. It is now installing an electron beam furnace. Union Carbide does not make mill products, but its sister company, Haynes Stellite, does. In addition to its columbium metal production it is one of two major producers of ferro columbium and ferro tantalum-columbium.

With enormous resources and experience and with the breadth of chemical and metallurgical talents available within the corporation, Union Carbide Metals ranks as a formidable competitor.

Du Pont. At present, Du Pont is interested only in columbium. It produces this at production facilities in Newport, Del. The firm will not say much about its capacity or processing scheme. Its production has been modest but can expand with the market. Best bet is that it separates the metals by a fractional distillation of the chlorides followed by hydrogen reduction.

There are some questions about the economics of its Colorado pyrochlore deposits. But they could provide an important bargaining position for purchase of other ore. Its approach to columbium is "that of the chemist," says Henry Peters, marketing manager of metal products for the Pigments Dept. "We feel the way to do this is by employing chemical techniques to make as pure a metal as possible." So far it has been notably successful. Its D3 Columbium is the purest material on the market, containing less than 200 ppm. oxygen, 30 ppm. nitrogen, 30 ppm. carbon. It is also the most expensive now.

Du Pont has built a \$12-million mill in Baltimore. This seems to be unusual for the company at first glance. But it is in keeping with its philosophy of trying to make and keep a pure metal, avoid electron beam melting or other clean-up steps. "And," says Peters, "we feel the problems are sufficiently specialized so that we can make a contribution through production of mill products of high-quality standards."

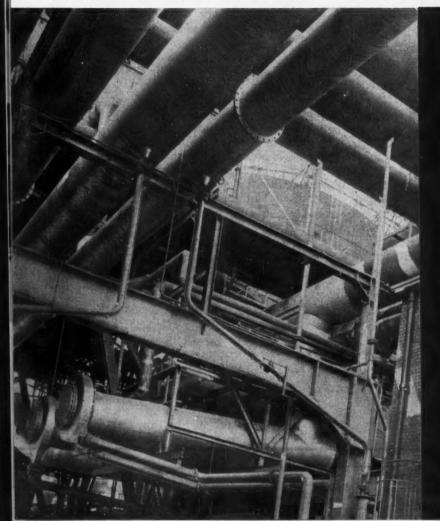
For some time, Du Pont has had a cooperative development program with Thompson-Ramo-Wooldridge, a big supplier of turbine blades, for evaluation and cultivation of know-how on fabrication of columbium alloys.

Du Pont, like Union Carbide, must be rated a top contender in the columbium race. And although it is interested only in columbium now, it does admit that for the long pull, it will have to either make tantalum or find a customer for tantalum concentrates.

National Research. NRC Metals makes only tantalum. It is thought to buy fluorides (from Mallinckrodt), reduce them with sodium. Its capacity when it started

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Literature describing these products will be gladly forwarded on request. Fill in the coupon and send it to us. production in '58 was 30,000 lbs./year. Since then, it has bought in three expansions, the last one 33%, completed in Jan. '61. It has developed its own electron beam furnace, featuring a double vacuum system (CW, March 7, '59, p. 39) and reports it is "active in electron beam technology." It makes both technical and capacitor grade powder, ingots and a line of mill products. It is piloting columbium but has no plans to start production.

Right now, the firm says it is satisfied with its nonintegrated position, doesn't want to tie up a big investment while the market is so uncertain. For the long run, however, it is likely to integrate somewhat in both directions if the market lives up to expectations.

Kennametal. A producer of both metals, Kennametal is something of an unknown quantity. It produces powder, electrodes, sheet and tube. It does not have an electron beam furnace but has ingots cast for it on a toll basis. It reports it has stepped up its capacity four or five times since it started. That would give it a capability of at least 150,000 lbs./year for both metals. It considers its processing proprietary, some of its methods are thought to be conventional, some different. It has separation facilities but also is thought to buy intermediates, and is thought to use a carbon reduction for most of its metal.

Shieldalloy. Although it does not have production facilities for either metal, Shieldalloy supplies both through an arrangement with Hermann C. Starck of Goslar, Germany. It sells tantalum in both capacitor and technical grades and has columbium powder available in several grades. It does have facilities for alloys manufacture at Newfield, N.J., and is one of the major producers of ferrocolumbium and ferrotantalum columbium.

Mallinckrodt. Mallinckrodt produces high-purity columbium and tantalum chemicals, primarily potassium fluotantalate and columbium pentoxide. It had been processing euxenite for Porter Bros. and returning a mixture of concentrate oxides. With the expiration of the government contract, it has turned to importing ores, selling its output itself. Its capacity is probably over 100,000 lbs./year (on a metal basis) of each product.

Its method of separation is a selective precipitation. Its patents (U.S. 2,859,098; 2,859,099) indicate it adds a hydrous columbium oxide to a mixture of complex fluorides of tantalum and columbium, causing the tantalum to precipitate.

The firm has given thought to manufacture of the metal, but has no plans along those lines as of now. "We're content to be a supplier of chemicals to the metal makers," says Fred Belmore, vice-president. However, he doesn't rule out the possibility of a joint venture to improve its ore position. And should National Research start to integrate backwards, Mal-

linkcrodt would doubtless reconsider its position.

Stauffer Chemical. The other main supplier of columbium and tantalum chemicals, Stauffer operates a plant at Richmond, Calif., for chlorinating, then separating by fractional distillation. The plant has been operating for just about a year.

Says Chet Arnold, vice president, research; "We're convinced that ultimately, this is the way to separate them. There are some pretty fierce technological problems, but our plant is coming around to a highly satisfactory operation."

Designed yearly capacity of the plant is about 1 million lbs. of pentachlorides, enough to make 500,000 lbs. of metal—the present annual production. It sells columbium pentachloride for \$5/lb. in large (2,000 lbs. or more) lots; tantalum pentachloride on the same basis for \$10/lb. It would probably be willing to negotiate a long term contract for large quantities at a considerably lower price.

Stauffer's marketing activity is limited right now because Du Pont is thought to be the only producer reducing the chloride and Du Pont has its own separation facilities. However, Stauffer is selling some chloride, overseas and domestically. And though the metal is the main market for chlorides, there is some interest in the compounds themselves. Battelle, for instance, has worked on an *in situ* reduction to coat directly for use as a nuclear reactor fuel.

Stauffer has a solid position in electron beam furnaces. It sells production furnaces; Temescal builds them to Stauffer's order. Patent rights are owned two-thirds by Stauffer, one-third by Temescal. Stauffer also does electron beam melting on a toll basis and sells billets and mill products.

In addition, its hydrogen reduction developed for titanium should be well suited to columbium production as well. It's clear then that Stauffer is a potential metal producer. However, if it should land a substantial customer, it might well forgo some of the investment (and problems) of metal production.

Rounding Out: The firms above don't constitute a complete roster of potential columbium-tantalum producers or firms with an interest in the field by any means. National Distillers, for example, has pilot-planted a columbium process, is now watching developments before it makes a major move. Metal Hydrides has recently reported sales of high-purity columbium (among the metals) made by iodide reduction on a crystal bar. Molybdenum Corp., through participation in Brazilian ore and production of ferrocolumbium (capacity: over 11 million lbs./year), has more than an academic interest in columbium.

What it does show it that a large number of firms are eagerly bidding in a market that could be non-existemt. It means only that the rewards will be commensurate with the risks.

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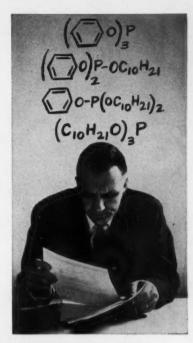
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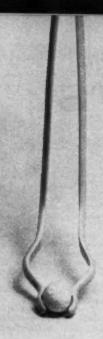
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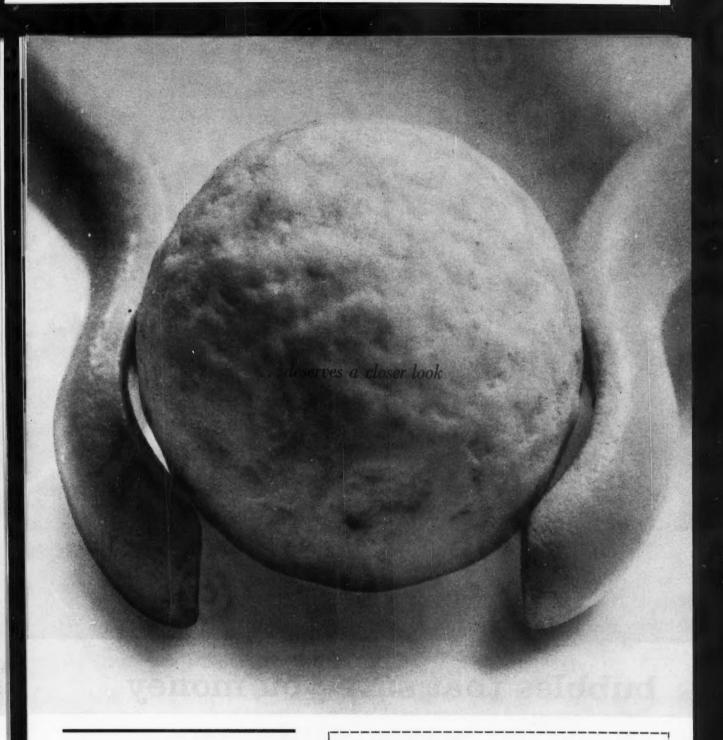
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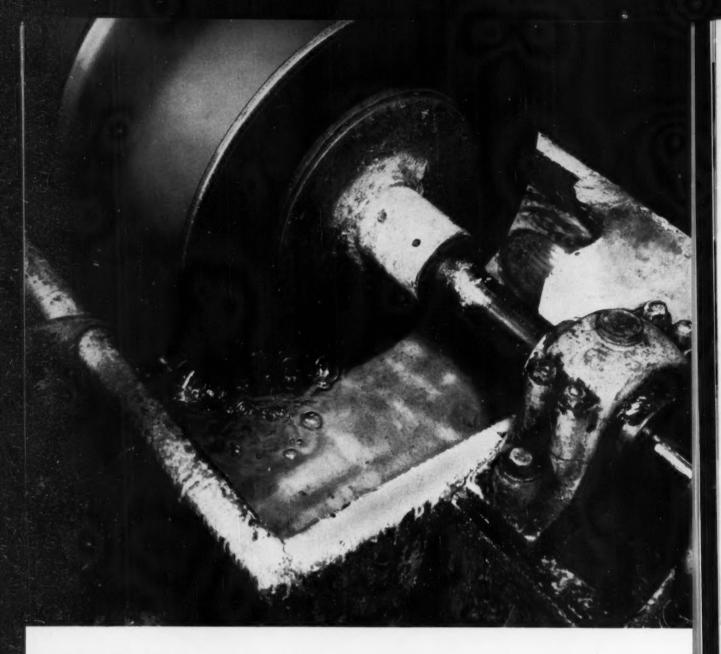
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Market

Newsletter

CHEMICAL WEEK May 6, 1961 Big news this week concerns chemical prices. A few are up, but it's the downs that have the market in an uproar.

Refined glycerin tabs have been slashed $2\frac{1}{4}\frac{e}{lb}$, to the lowest level in years. The action reportedly was initiated by synthetic producer Shell Chemical. Dow, the other major producer, followed suit immediately, as did major soapers such as Procter & Gamble. New tags peg 99.5% material at $25\frac{e}{lb}$; 96% at $24\frac{e}{lb}$.

The glycerin market has been wobbling—orders off, crude imports pouring in—so in one sense the latest cuts come as no surprise. Jolting to marketers, though, is the fact that similar slashes were posted only a few months ago—and for the same reasons (CW Market Newsletter, Jan. 7).

Expect the glycerin market to get rougher as domestic competition increases. Atlas Powder's new plant (to turn out an estimated 30 million lbs./year of glycerin) should be operating in about a year. But the new (and delayed) Olin project at Doe Run, Ky., will be in before the end of the year. Half the estimated 30-35 million lbs./year of glycerin output will head for the open market, aggravate the long supply-short demand situation.

Don't count on a price war in polyester fibers. A feeling in some circles that one might develop grew out of the fast action by rival producers to meet Du Pont's earlier cuts on Dacron (CW Market Newsletter, Apr. 22). Uncertain, too, was the course Beaunit Mills would take.

The Du Pont reductions, and those posted by Celanese (Fortrel), and Eastman Chemical (Kodel), established new prices ranging from \$1.14/lb. for 1½ denier to \$1.24/lb. for all other deniers. The cuts only partially erase the market spread in effect since last fall when Beaunit's Vycron was dropped to \$1/lb. for all deniers.

But CW learns that Beaunit contemplates no change in its polyester fiber schedules, appears satisfied with the new, though narrower, differential. Meanwhile, the company aims to bring Vycron production at its Elizabethton, Tenn., plant to capacity levels (12 million lbs./year) later this year.

U.S. polyester film capacity gets a boost. Du Pont's new, \$20-million Mylar plant at Florence, S.C., will start turning out the material this month. It's the company's second Mylar unit (the other is at Circleville, O.), and just about doubles the firm's polyester film capacity. Last year the Circleville plant's capacity was expanded 30%.

Production of citric acid is under way in Mexico. It's only a startup now, but Miles Chemical's new, \$1.5-million plant at Cuernavaca (near

Market

Newsletter

(Continued)

Mexico City) will be fully operational by the end of the month. The cane sugar fermentation project has a "designed" capacity of 3 million lbs./year (enough to satisfy current Mexican demand), but can be easily expanded to 6-8 million lbs. if needed, says Miles President H. F. Roderick.

The citric price situation in Mexico is still clouded. Until now the market there has been served solely from imports, and price cutting has been rampant. Some say the moves have been aimed at discouraging "local" production.

Miles hasn't yet set a price on its Mexican output, but chances are the tags will be pegged in line with U.S. prices. That would put them near 29-30 e/1b. Before the recent chaotic cuts, prices in Mexico were about 40 e, including duty and shipping.

Butenediol is priced lower this week. Antara Chemicals (General Aniline & Film) has cut the price to 69 e/lb, down from a previous 73 e. It's the second reduction in a year on the high-pressure acetylene derivative (original development price was \$1.25/lb.), and marks achievement of full-scale commercial status.

Tank-car shipments are now being made from GAF's Calvert City, Ky., acetylene chemicals complex.

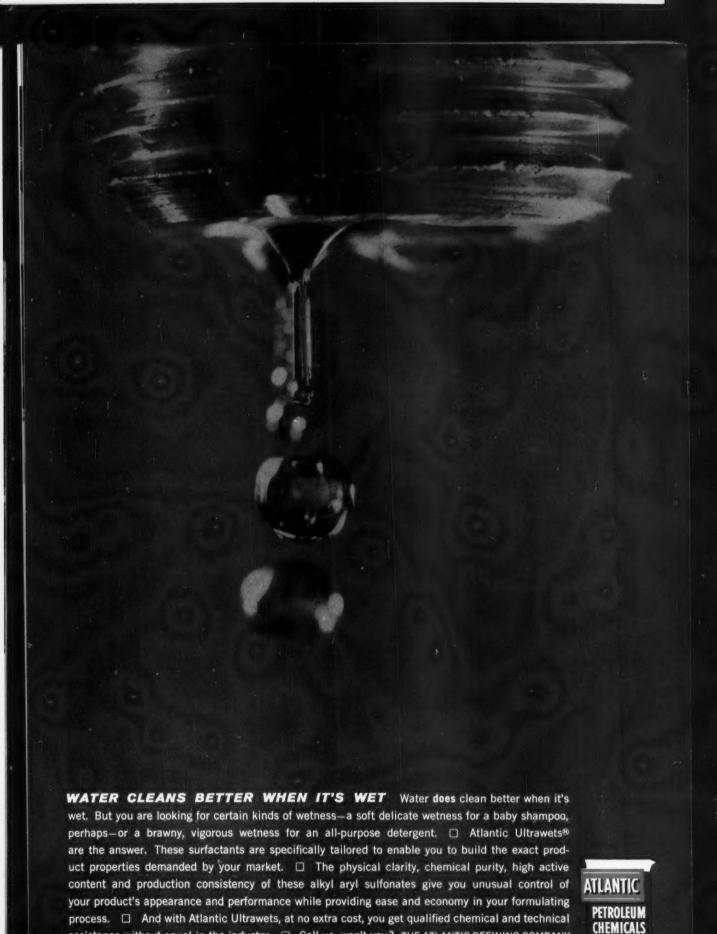
Down come prices on pure beryllium metal powders. Soon-due expansions at Brush Beryllium Co.'s Elmore, O., plant (see also Business Newsletter, p. 33) will reduce prices of Brush Virgin Powder (100 series) about 12% and the more widely used blend powder (200 series) at more than 15%. The new quotes, respectively: \$62.50/lb. (down from \$71); \$54/lb., reduced from \$64. Prices are for 20,000-lb. base lots.

Canadian paint hope petering out? Apparently so, as far as a U.S. market for Canadian Industries Ltd.'s Dynakote is concerned. The company says it is "curtailing marketing efforts" on the acrylic finish in the U.S. Reason: to give appliance manufacturers in the Midwestern states a chance to do more "development work". CIL Paints had been established in Cincinnati to make and sell up to 250,000 gal./year of the new finish (CW, Dec. 5, '59, p. 45.)

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Glycerin (syn.), tanks dlvd. 96%	0.0225	0.24
Glycerin (nat. refd.), tanks dlvd. 96%	0.0225	0.24
Glycerin (nat. refd.), tanks dlvd. (high-gravity)	0.0225	0.2475
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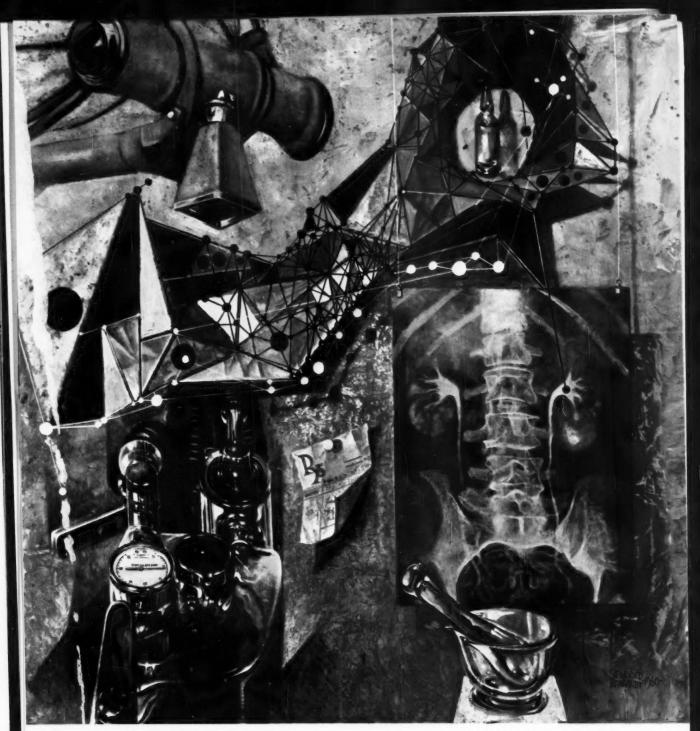
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Chemical Week Buyers' Guide Published... September 30

Issue



"Medicinal Specialties," one of a series of six paintings created by Siegfried Reinhardt interpreting important industries and professions served by Mallinckrodt.



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Whit Lonsdale, Vice President and chemical salt specialist of the Diamond Crystal Salt Company, looks over a shipment of salt with Chester D. Jones, Director Purchasing for Diamond Alkali, and Maurice Sullenden (center), General Manager of Diamond Alkali's Muscle Shoals plant.

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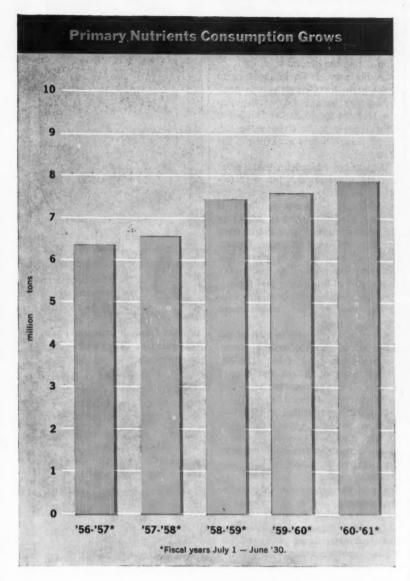


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Upswing for Fertilizers

By the end of this current fertilizer year (June 30), total demand for primary plant food nutrients—nitrogen, phosphorus, potash — should chalk up another record total and pass the 7.8-million-tons/year mark (chart, above). This represents an increase in demand of about 4% for each of the basic nutrients over last year's level. Although certain factors—e.g., the government's new feed grain bill—will act as a brake on fertilizer consumption, several unfolding

trends will take up the slack. Net Result: '61 will be another boom year for fertilizer makers.

Contributing to the bright outlook: the anticipated acreage increases in the planting of cotton, tobacco, barley and other major crops; the continuing trend toward more fertilization/acre; the general good economic condition of the farmer; good weather conditions during the early part of the fertilizer year.

However, some observers point out

that if the new feed grain bill had not come into existence, demand for primary plant nutrients might have gone over the 8-million-tons/year mark to register a 6% increase over year-ago demand.

There's little doubt that the biggest controversy in the fertilizer industry today is the new feed grain bill and its probable effect upon fertilizer consumption during the rest of the year. Although experts throughout the country have given considerable study to the problem, no general agreement has been reached.

Feed Grain Import: The current feed grain program, as disclosed by the Secretary of Agriculture, is voluntary. It applies to only corn and grain sorghum producers, who can cut their acreage 20-40% from the '59-'60 level but must put the land into a soil conservation program or plant certain prescribed crops. Benefits to eligible farmers: price supports on corn and sorghum produced and cash certificates equivalent to 50-60% of the average production per acre for the acres diverted.

But since the program is voluntary, its impact on total fertilizer demand depends upon the extent of compliance by farmers. It's unlikely that the 70% level estimated by USDA will be reached. But it appears that over 50% of eligible farmers will sign up, and the total corn and sorghum acreage could be cut by about 10%. Since corn crops alone take at least 40% of the total fertilizer consumed in this country, a 50% compliance with the program could exert a tremendous influence on the fertilizer industry.

But, at the same time, it's felt that the guaranteed earnings the farmer would receive—from cash certificates for diverted acreage, along with the price supports for his production should influence him to increase his level of fertilizer application.

Regional Highlights: Here's a capsule summary of the fertilizer outlook in various sections of the country.

Southeast: In general, fertilizer sales in the Southeast are booming. In spite of heavy rain during the past six weeks, fertilizer movements are ahead of last year. Sales of all the primary plant nutrients are expected to register considerable gains by year's end. The



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feed grain bill, so far, has not been subscribed to by very many farmers in this area. The bill came too late to affect southern Georgia, and this state should register increased corn production during the current year.

A big move is on in the state to grow grain for Georgia's huge poultry industry, instead of depending upon the Midwest for its needs. This move should prove to be a boon for fertilizer manufacturers marketing in the state.

Among other highlights in this area:
(1) A move towards increased fertilizer application per acre and towards higher analysis fertilizers is evident. (2) Bulk blending is picking up momentum. (3) More use of trace elements (boron, manganese, copper, zinc and iron) is taking place. Soil analyses have pointed up their utility in this part of the country and agricultural experiment stations are educating farmers in trace-element use.

West North Central: In spite of too much rain this spring, fertilizer movements are far ahead of last year. Nitrogen and potash are the biggest gainers. There seems to be a big switch to ammophosorus materials.

Also, it appears that the government is getting a good response to its feed grain bill. Consequently little or no increase in fertilizer consumption can be expected in this geographical area.

Liquid nitrogen solutions are booming—primarily due to the increase in irrigation farming. But prices are soft on mixed fertilizers. Indications are that these materials are generally holding on to their posted prices with the exception of ammonium nitrate. Some reports show that prices for this material are being slashed as much as 10-15%.

South Central: Although fertilizer shipments in this area are ahead of last year, the consensus is that only a small gain will be registered by the year's end. Nitrogen and phosphate fertilizers are moving best. No shortages of supply are evident at the present time.

Weather has delayed planting in several sections of the South Central region and has caused delayed fertilizer shipments. A definite trend is noticed towards urea and ammonium nitrate solutions.

East North Central: The response

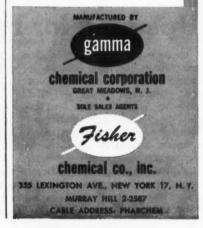


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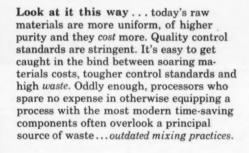
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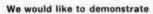
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CHEMICAL WOBBLE with NALCO Organics

A peg that almost—but not quite—fits a hole will wobble when placed in that hole. The same principle applies to organic processes. An organic chemical may be applicable (to one degree or another) in a given process. But if it doesn't fit the process exactly, the result is "chemical wobble".

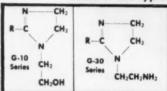
The way to avoid chemical wobble in *your* processes is to use a custom made organic, manufactured specifically to meet your individual requirements. And when you need custom made organics, Nalco Chemical Company is the place to look for them.

Nalco has already helped many manufacturers eliminate chemical wobble, supplying them with specific organics to meet specific needs. (Don't ask what they are, however—Nalco keeps all customers' requirements, and the nature of the organics made for them, in strict confidence.)

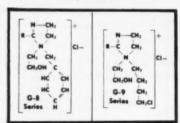
In many cases, the manufacturer had to do no more than submit his requirements to Nalco. Nalco researchers then developed the exact chemical to meet his needs, and also determined the most efficient and economical method of manufacturing it.

Nalco organics include surface active agents, film-formers, emulsifiers, and dispersants. Among their many uses, they are suitable for corrosion inhibitors, bactericides, antistatic agents, plasticizers, flotation reagents, pigment grinding and flushing aids, wetting agents, and foaming agents. Many are also specific chemical intermediates.

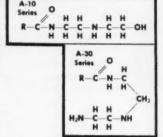
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Oxyalkylation products. These include adducts of abitol, castor oil, alkyl phenols, phenolic resins, tall oils, and fatty amides, polyalkanol polyamines, and polyalycol monoethers.

These organics, and many others, can be manufactured to your specifications, in quantities from a few gallons to tank car lots. When you need a specific chemical to eliminate a wobble in your processes, call on Nalco.

Further information, technical data, and samples of the materials mentioned here are available on request. For a more detailed outline of Nalco organics, write for Nalco Bulletin K-6.

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by farmers to the feed grain bill is high, so far, in this region. Consequently fertilizer sales are expected to suffer.

Result: The over-all forecast for this region is not too promising. However, potash materials continue to be tight in some sections.

Western: The weather in California has been normal and so far demand is good. But the weather in some parts of Washington has delayed plantings. The trend towards liquid fertilizers continues strong.

Compliance by farmers with the Kennedy farm program in the Far West is still uncertain.

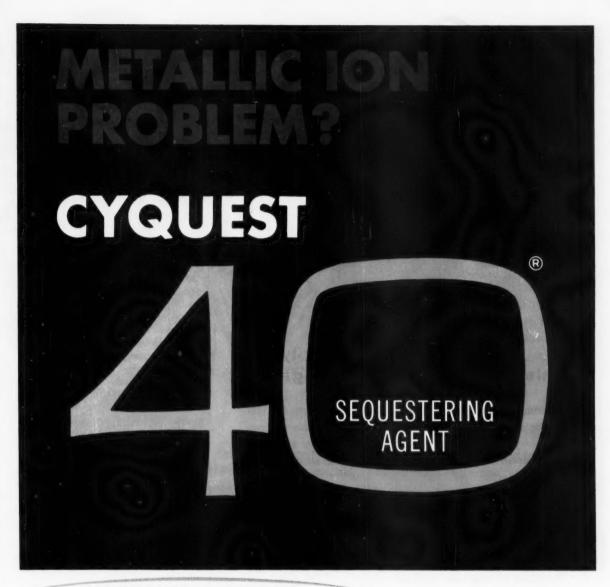
Farmer's Economic Health: Three factors defining the present and immediate future economic health of the farmer measure his ability and willingness to purchase fertilizers: cash farm receipts, prices received by farmers, and bank deposits. All three indicators point to a good economic climate for increased fertilizer purchases during the current year.

Cash farm receipts in '60 were excellent and the '61 outlook is equally good. Net farm income during '61 is also expected to be high. Farmers' profit incentives during '61, based on '61 prices vs. production costs, should be at a high level. Also, farm bank deposits are at a record high.

The farm financial scene is set for increased fertilizer purchases during the current season and the trend towards more educated levels of fertilizer application is in progress.

Education Pays Off: Farmer education program aimed at increasing fertilizer application to optimum levels have been in progress for several years. These programs are sponsored by many different types of organizations: federal and state governments, industry associations, colleges, civic organizations and fertilizer manufacturers. On the whole, these various groups have met with outstanding success. Farmers are doing more soil testing and are evidencing a growing acceptance for proper fertilizer technology.

This trend towards higher level of fertilizer application per acre has been evident for at least 20 years. And the trend will certainly be accelerated by the large number of educational programs under way. During '60, about 49 lbs. of fertilizer were applied per acre, an increase of 16



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lbs./acre over '55's level of 33 lbs. In '61 application per acre should advance to at least 52 lbs.

Acreage Tally: Many of the major crops will register acreage increases during the current year. The biggest gainer will be cotton. Acreage allotment for this crop has been raised to 18.5 million acres this year. While harvested acreage in '60 amounted to only about 15.3 million. In addition both tobacco and sugar plantings will be upped. However, these increases in acreages alone will not be able to offset the decreases that the feed grain bill will effect.

But still one of the most important and unpredictable factors influencing fertilizer consumption. Under ideal weather conditions, farmers will use more fertilizer. When the weather is too wet or too dry, fertilizer consumption is cut down. So far this year, weather has been generally favorable.

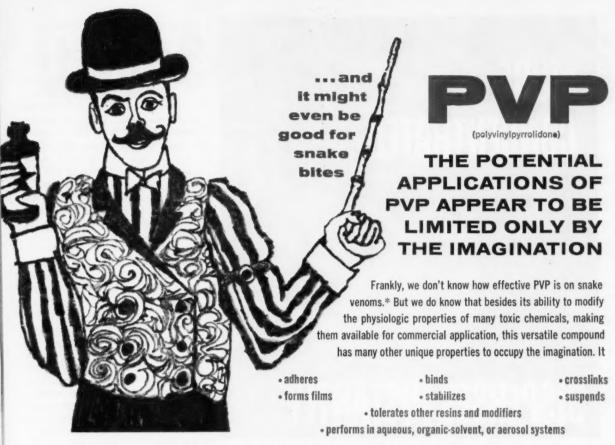
During the early part of the season, farmers were able to lay down their first application of fertilizer unhampered by unfavorable weather conditions. At present, some planting delays are being encountered. But the weather situation is generally considered favorable and there's optimism in the industry.

In sum then, the over-all outlook for the '61 fertilizer season is highly favorable. The American farmer is in a better financial position than he has been for several year, a good omen for increased fertilizer purchases during '61.

The trend towards higher level of application per acre continues and, in fact, appears to be accelerating as farmer education programs intensify. And the acreage of barley, tobacco and sugar crops is on the upswing this year which, of course, further expands fertilizer demand.

Generally weather has been good so far this season and should not have a depressing effect on fertilizer movements for the remainder of the season.

Thus, every important factor is favorable for increased fertilizer consumption this year—with one exception: current feed grain program. Although this bill will cut corn and sorghum acreage by about 10% the plus factors will be enough to hike primary plant food nutrient demand to record levels.



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*The possibility of detoxifying snake venom has been suggested by Schubert, R.: Deut. med. Wochschr. 73:551 (Nov. 19) 1948, and a statistically significant prolongation of survival time in mice injected with cobra venom and PVP has been demonstrated by Trethewie, E. R.: M. J. Australia 43:8 (July 7) 1956.



From Research to Reality

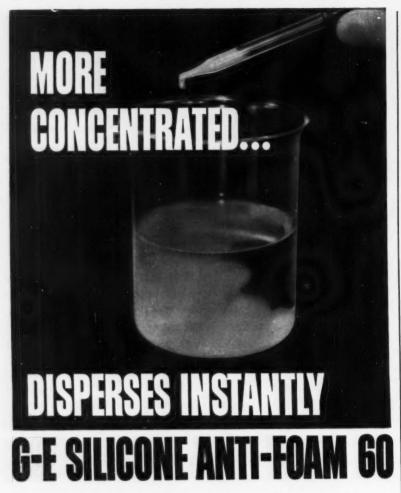
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MARKETPLACE

Gluconic Acid: A new gluconic acid and sodium gluconate plant was recently put on stream by Industrial Biochemicals, Inc. The new unit, located in Edison, N.J., has an output potential of 4.5 millions lbs./year.

Sodium gluconate finds its major application in metal finishing and bottle washing and disinfecting applications. According to the company, the market for this product has been growing rapidly during the past few years.

Insecticides: Insecticide sales in the South Central region of the country are considerably up from last year, according to some of the producers. The early outbreak of cotton and grain insects in this area is the reported reason behind the market expansion. Early season insect control on cotton for the control of boll weevils and cut worms is already in full swing in some parts of the country. There has also been a widespread outbreak of green bugs on small grains in many areas of Texas. It adds up to a promising year for insecticide manufacturers.

Germanium: The germanium market continues to grow rapidly as an active element for the manufacture of transistors. The bulk of the material used in this country continues to come from the Congo. However, U.S. producers are stepping up exploration in this country. Susquehanna Corp. (Chicago) recently revealed that it is actively engaged in a promising mineral exploration program near Santa Fe, N.M.

Thioacetic Acid: A new pilot plant for the production of thioacetic acid was just started up by Stauffer Chemical. The compound is being sold as 95% pure (minimum) for \$1.25-1.65/lb., depending on quantity. Suggested uses: production of N-mercaptomethyl polyamides, synthetic resins, pesticides, esters and additives for rubber and oils.

Nickel: International Nickel Corp.'s new Manitoba, Can., nickel plant, which took four years to build, is expected to be operating before the end of this month. Rated capacity: 75 million lbs./year.

HEMICAL

A Series for Chemists and Executives of the Solvents and Chemical Consuming Industries

New Method for Detecting And Analyzing Chemicals & Gases Uses Radioactivity

A new technique for super-sensitive detection and analysis of chemicals and gases, by reacting them with a radioactive compound, is covered in a patent issued recently. Called "radiometric exchange," the basic principle is said to have great potential in air pollution studies, atmospheric and outer space measurements, and industrial process control.

Techniques evolving from the new method are reported to offer several advantages over previously existing techniques:

- (1) extreme sensitivity, with accuracy in the parts per billion range.
- (2) continuous monitoring and analysis for long periods without attendants.
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- (4) selectivity.
- (5) detection of wide range of com-

In a typical case-air pollution studiesthe principle has been applied to the measurement of sulfur dioxide in the atmosphere by drawing the air through a small reaction cell. Sulfur dioxide in the air reacts in the cell to form a radioactive gas. The amount of radioactive gas generated is directly proportional to the amount of sulfur dioxide in the air. By counting the radioactivity present with a geiger counter, direct determination of sulfur dioxide is made.

Methionine Seems to Play Role in Reducing **Cholesterol Deposition**

Studies at a Chicago hospital have correlated influences of dietary patterns on cholesterol formation and artery disease incidence. The research was carried out on poultry and confirms previous observations on monkeys and rats.

In the tests, restricted intake of methionine by chicks on a high-cholesterol. high-fat diet resulted in increased deposition of cholesterol. There was also increased coronary and aorta atherosclerosis. High-protein, high-vitamin supplementation tended to suppress these conditions. High protein feeding alone seemed to reduce coronary atherosclerosis only. High vitamin feeding alone had no effect. The type of protein fed also appeared to be a factor. Soy protein gave better results than casein- gelatin.

Banner Year for Fertilizers Expected in 1961

Greater Capacity for Sulfuric Acid, Phosphoric Acid, and Phosphates Will Couple with Trend to High Analysis Fertilizers. Gross Tonnage Unchanged but Dollar Volume Will Be Up.

The Business and Defense Services Administration, U.S. Department of Commerce, predicts that the 1961 fertilizer season will be slightly better than

the 1960 season. Dollar volume of all chemical fertilizers shipped in 1960 is estimated at \$1.220 billion, \$40 million higher than 1959. Dollar volume is expected to increase again in 1961. Gross 1961 tonnage, however, is expected to remain unchanged at the 25.3-million ton level of 1960 because of the shift to higher analysis fertilizers.

Ammonia and Sulfuric Production Up

For November 1960, the Census Bureau duction for 1961. About 1.5 reported synthetic ammonia production million short tons of acid ca-

at 408,035 short tons; ammonium nitrate fertilizer grade production at 259,948 short tons; nitrogen solutions production, including combinations with urea, at 63,326 short tons. All figures were up from November 1959. This trend is expected to continue through the heavy spring selling season.

The Business and Defense Services Administration expects a 2.5-million ton in-

crease in sulfuric acid pro-

MORE

3-Gallon Sodium Dispersion Unit Loaned Out by U.S.I. for Eighth Straight Year





At left, sodium bricks are charged into melt tank. After liquefaction, sodium flows into dispersion preparation unit which is immersed in heated oil bath. At right, finished sodium dispersion is transferred by low pressure nitrogen into metal storage vessel.

This equipment was designed and built | actions; sodium alcoholate preparations; by U.S.I. in 1953, as an aid to companies investigating sodium dispersions on a pilot plant scale. It has been out on loan ever since-for 30-day periods-in plants from coast to coast.

This unit has been employed to prepare sodium dispersions for many types of reactions. Among them are included:

purifications; sodium alkyl and aryl preparations; metalations; sodium hydride preparations; acidic hydrogen replacements; polymerizations.

If you are interested in borrowing this unit, please contact Manager, U.S.I. Sodium Sales, U.S. Industrial Chemicals Claisen condensations; Wurtz type re- Co., 99 Park Ave., New York 16, N. Y.

May

U.S.I. CHEMICAL NEWS

1961

New Sedative Derived from Reserpine Acts Rapidly

A potent, fast-acting sedative has recently been derived from the drug reserpine. It is reported to achieve its calming effect within 30 minutes.

According to the results of tests to date, the compound does not appear to lower blood pressure, accumulate in the body, cause nasal stuffiness, or increase intestinal motility. These are all undesirable side effects of reserpine. The material also appears to be unusually potent in suppressing fibrillatory spasms of the heart.

The new sedative is identified as 18epi-O-methylresperate hydrochloride. The same synthetic method used to prepare the new compound has been used to produce additional compounds, it is reported. Some are said to have sedative action while others seem to show the anti-fibrillatory effect.

New Bulletin on FILMEX® Solvent for Flexographic Inks Published by U.S.I.

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FILMEX is also used for drying photographic film. After film has been developed, fixed, washed and rinsed in FILMEX, it dries in minutes and does not curl.

Copies of this new FILMEX bulletin can be obtained by addressing the Technical Literature Dept., U.S.I. Chemical News, 99 Park Ave., New York 16, N. Y.

CONTINUED

Fertilizers

pacity is being added this year in the form of new plants. Most of the output of these new facilities will go for manufacture of wet-process phosphoric acid and superphosphates. Total capacity by the end of 1961-25 million tons.

Change Due in Phosphate Use Pattern

Marketable phosphate rock output in the United States is estimated by the Bureau of Mines at 17.4 million long tons in 1960, 10% more than was produced in 1959. The Bureau reports that several expansions in phosphate production facilities in Florida are scheduled for completion this year.

Spokesmen for the Tennessee Valley Authority, another federal agency deeply concerned with fertilizers, expect that the trend to higher analysis materials will result in increased use of concentrated superphosphates, ammonium phosphates, phosphoric acid and other high analysis phosphates. Use of normal superphosphates is expected to decrease. A new 54% concentrated superphosphate has been developed which uses "superphosphoric" acid. The latter material is produced by a new TVA process.

Another new development reported by TVA is ammonium polyphosphate, with a typical analysis of 15-62-0. It can be used in solid mixed fertilizers, and is also said to be storable in solid form for quick conversion to liquid fertilizer as needed.

U.S.I.'s fertilizer raw materials production is centered at the company's Tuscola, Illinois, plant. A new ammonia storage tank designed to assure rapid delivery of ammonia, aqua ammonia, and nitrogen solutions during the fertilizer season has just been completed. U.S.I. also produces sulfuric acid for fertilizers at Dubuque, Iowa; De Soto, Kansas; and at Tuscola.

TECHNICAL DEVELOPMENTS

Information about manufacturers of these items may be obtained by writing U.S.I.

Isophthaloyl and terephthaloyl chlorides now offered in semi-commercial quantities. Suggested as intermediates in polymer preparations and in organic synthesis for pharmaceuticals, dyes, etc. Available as high-purity flakes.

New recorder said to expedite gas chromatography by charting peaks and areas simultaneously. Automatically integrates area while chromatogram is being recorded. Accuracy claimed to be $\pm 0.5\%$ full scale. No. 1711

N-Methyl acetamide — colorless, crystalline or ganic intermediate of 38.5+% purity, with melting point of about 28°C.—now available in semi-commercial quantities.

No. 1712

Safety guide covering emergency organisation in chemical plants can now be purchased at nominal price. Pamphlet stresses responsibilities of management in developing and administering emergency plans; recommends procedures.

New general-purpose laboratory shaking bath is claimed to be largest capacity standard shaking bath available with longest adjustable stroke. Designed to provide both continuous agitation and controlled temperatures.

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Carbobenzoxy chloride of 99.5-100% purity now on market. Said to be stable preparation which on market. Said to be stable preparation which can be used and stored with minimum hazard. Ordinary potency is maintained so that in acylating, reaction is more complete. No. 1715

First issue of Journal of Theoretical Biology was released recently. New international periodical will publish original papers on generalized theories, theories of specific processes or phe-nomena, theoretical discussions of specific pro-ects or methods, and the like. No. 1716

New flow meter features removable flow tube for convenient sterilization. Used to measure flows of pharmaceuticals, film emulsions, food ingredients and other conductive materials re-quiring accurate, sanitary measurement. Ne. 1717

Molecular models now offered are made of styrofoam. Scale: $1/\sqrt{2}$ in. per angstrom. Color scale distinguishes ionic, covalent, polar bonds. Sizes of atoms proportional to partial charge. No. 1718

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Bristol-Myers new cosmetic plant is headed by "Bertie" Freyer.

Germany's Cosmetic Boom

West Germany—a country where the national female image is a freshly scrubbed, natural-looking woman—is turning out to be one of the most profitable and growing foreign markets for the U.S. cosmetics industry. Four recent developments point up the increasing activity of American beauty makers there:

• Early this year Chesebrough-Ponds Inc. (New York) formed a sales organization to handle distribution of its full line of Ponds products, readied general plans for expansion in Germany.

• S. C. Johnson & Sons, Inc. (Racine, Wisc.) bought a German producer of creams, soap, and household specialties last month.

Bristol-Myers Overseas Corp.
 (New York) has just put a new cosmetics plant onstream in Neu-Isenberg.

• Lehn and Fink Products Corp. (New York) will start construction of a new plant in June to produce its Dorothy Gray cosmetics, with completion date set for first month of '62.

This follows the entrance of two major U.S. marketers into the German market last year: the U.S.'s biggest cosmetic house, Avon Products, and Shulton Inc. with its men's toiletries line. Both companies, as yet, have no manufacturing plants.

The optimism of U.S. companies that have recently set up or expanded operations in Germany has been generated by the country's rapidly growing economy and population, relatively low unemployment, high wages, and a revival of fashion consciousness since the war. The German woman's increasing acceptance of cosmetics has pushed industry sales to \$158 million (factory sales) last year and growth to a rate of about 14%/year.

U.S. Glamour Vendors: Chesebrough-Ponds, with half of its \$70 million/year sales coming from overseas operations, is now launching a sales arm in Dusseldorf called Chesebrough-Ponds GmbH. In the

SPECIALTIES

future not only Ponds creams but a complete line of cosmetics will be sold on the German market. Plans are in the works for introduction of new products and for considerable expansion of its present staff. The company also expects to build a manufacturing plant but has not revealed whether it will be in Germany or another European country.

Until now, Ponds creams were made and distributed by a German agent, Dr. Wurmboeck GmbH. in Munich. The company, which has been selling over \$500,000/year in creams, will continue to make Ponds products until '62.

C-P's recent acquisition, Northam Warren, is also big in Germany with its Cutex line of lipstick and nail polish, which it manufactures jointly with the German firm Junger und Gebhardt GmbH. (Cologne.)

Bristol-Myers bought the German company Khasana GmbH. in '58 and is now producing a broad line of toilet goods and cosmetics in a newly built \$500,000 plant. Khasana has research labs and will be able to develop products tailored specifically to German tastes.

Max Factor started to manufacture in Germany in '59, last year expanded operations by moving to a larger plant in Munich. Factor, one of the top selling general cosmetic companies there, feels that the only successful route for a U.S. manufacturer in Germany is to produce on the spot. It says that export sales don't capture a big enough chunk of the market because of high import tariffs.

Two significant newcomers to the market, however, are keeping operations to selling for the time being. Shulton sees a rapidly expanding market for men's grooming products shaping up and expects to manufacture eventually. The door-to-door technique of Avon's affiliate, Kavon Cosmetics, GmbH., is a novelty for the Germans but if results are similar to go in other foreign countries where Avon has stepped in, it is likely sales will make a plant necessary.

S. C. Johnson minimizes the toiletries end of its newly acquired Defren-Kosmetika Curt Luchtenberg KG (Solingen) and intimates that the reason for the purchase was Defren's consumer household specialties—e.g.,



Gearing for growth in private label toiletries: Kolmar's Stoffel and Rix.

stove polish—and auto wax products. However, Defren is fairly well known in Germany for its creams and also makes soap, sun tan lotion, and pine fragrance.

Lehn and Fink's wholly owned subsidiary, Schulke & Mayr, GmbH., is now importing from its French, British and U.S. operations but will be producing locally by '62. William V. Reynolds, Director of International Operations, forecasts that German cosmetic market is growing at such a significant rate that he expects Dorothy Gray sales to climb 70% this year.

One of the U.S. cosmetic industry's biggest private label houses, especially in lipsticks, Kolmar Laboratories (Milwaukee) has also established itself in Germany's private label business, serving both German and U.S. companies. Through its subsidiary, Kolmar Kosmetik Deutschland GmbH., it operates a plant in Offenbach, now being expanded, and a research center in Wiesbaden.

Other companies producing in Germany are Warner-Lambert Pharmaceutical Co., which jointly operates a soap and perfume factory with German firm Gustav Lohse AG., and Coty, Inc., which owns a 45% interest in a cosmetics company controlled by two German companies, Blendax Werke and Margaret Astor.

Many Local Firms: Over 200 local companies currently make up the cosmetics business in West Germany. Most of these, however, are small-scale operations with sales under \$500,000/year. But even the major

Booming German Beauty Market Lures U.S. Firms

companies rarely sell over \$1 million/year.

The leaders in the German cosmetic industry:

• Ferdinand Muhlens GmbH. (Cologne) manufactures the well-known line of 4711 products. (The numbers are the address of its head-quarters building). Products include the 4711 cologne and perfume, also soap, powder, skin cream and lipsticks. The company has world-wide exports, including considerable strength in the U.S.

 Beiersdorf AG (Hamburg) makes a full line of skin creams. Its big seller is Niveacreme, a general skin preparation that has established itself solidly in Germany.

 Hans Schwartzkopf GmbH.
 (Hamburg) produces hair creams and tonics, shampoo, toilet water and perfumes. It is the best known marketer of men's products.

• Georg Dralle AG (Hamburg) sells hair preparations and shampoo. Its major success has been Birkin, a hair "restorative" for men.

• J. G. Mouson und Sonne GmbH. (Frankfort/Main) is the strongest German rival to 4711 in toilet water and perfume. Its House of Postkutsche products are lower priced, however, than 4711 and French imports.

 Blendax Werke (Mainz) is the top seller in the toothpaste field, also makes soap. Through its affiliation with Coty and Margaret Astor, it sells makeup, lipstick and nail polish.

Wolf und Sonne GmbH. (Karlsruhe) is Germany's leading manufacturer of children's skin preparations, powders, and creams. It is also strong in the men's field, with shaving lotions, shaving cream, and hair products.

Chic from U.S.: German women believe that the U.S. is the fashion source for most cosmetics, just as they regard French perfume as the best.

This esteem results from influence of Hollywood movies, fortified by the presence of large numbers of American soldiers and their wives in Germany since the end of the war.

Only in the last eight years or so have toiletries and cosmetics been regarded as necessities by the Germans. Today hair products—dyes, tonics, shampoo, lacquers—are the best selling toilet goods with sales rising 14% in '60.

Skin creams and body powders rose 9% last year; sales of perfume climbed 23% and colognes, 20%.

Decorative cosmetics, whose use was traditionally thought to be unhealthy and unladylike, went up 14.5% in '60. Aerosol-packaged cosmetics are also sharply on the rise in popularity.

The Conservative Fraulein: Often U.S. beauty producers can use their standard marketing techniques in Germany. But the big problem they must cope with is the cosmetic-shy fraulein. Only 42% of potential consumers use cosmetics, mostly teenagers and women under 30 living in big cities. There is still a feeling that cosmetics are wasted money and unhealthful. Cheesebrough-Ponds tries to adapt its promotions, emphasizes health rather than glamour.

In addition, German laws governing advertising, promotion, and labeling are much stricter than those in the U.S. Sales premiums or two-forone offers are illegal, and product claims must pass rigid tests.

Present labeling laws make no allowance for double duty products like medicated cosmetics. A manufacturer would either have to represent his product as a medicine or a cosmetic—not both.

Outlook: The rapidly growing German cosmetic market shows no signs of slowing down, and should offer ripe profits to U.S. companies located there for a long time to come.

Diet Bar Bows

A new twist in diet foods will appear in test market this week in Atlanta. It's a dry diet food in the form of a large candy bar that tastes like cake. Called Taper, it's made by National Research and Development Corp. (Atlanta) and claimed to be the first diet dry food. The new item is out to snare a part of the \$100 million diet drink market.

The 7½ x 2-inch bar comes in three flavors—spice, lemon and chocolate—and contains 416 calories. Price: 59¢. Test market sales will be through drug stores only, with distribution through wholesale drug firms when the product goes national.

The company says Taper grew out of research on nutritional requirements of men in space. The oar contains no depressants or drugs and can be made in a commercial bakery.



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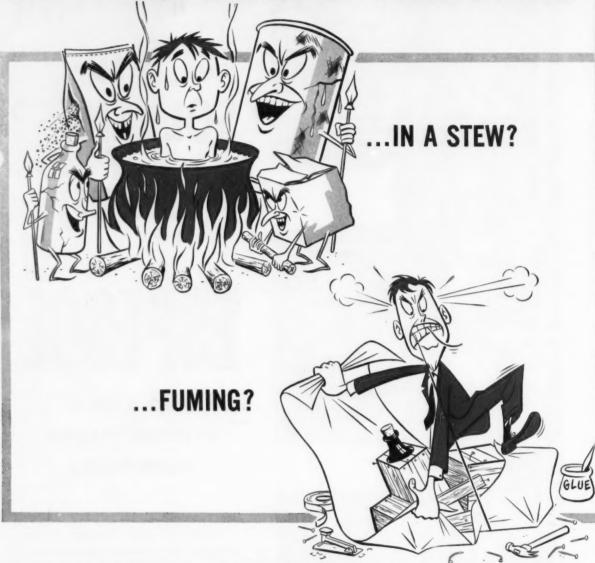


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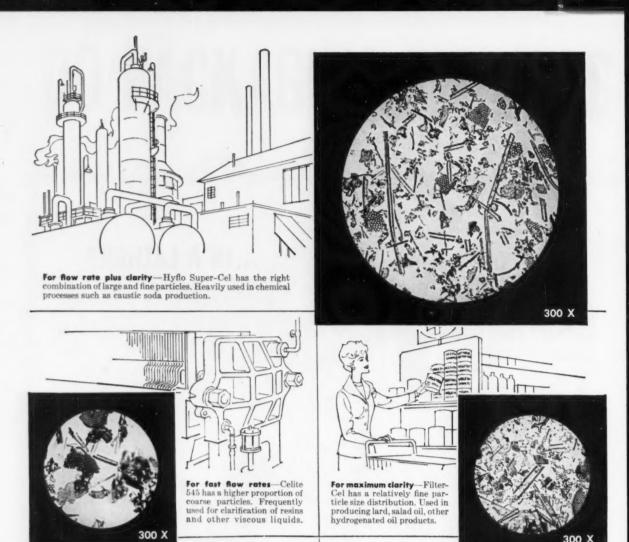
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Product liability insurance costs are going up and policy terms are getting stricter. But a good policy is virtually a necessity.

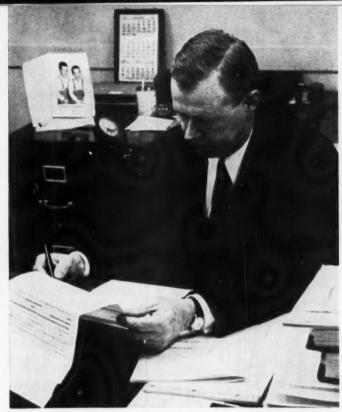
Keeping a Lid on Protection Costs

Last week, the insurance manager of a large chemical company sputtered to Chemical Week: "It's getting tougher all the time to buy good coverage on product liability. We have to haggle over terms, try to keep exclusions to a minimum. And rates seem upward bound while the policies become stricter." But he, and other experts surveyed by Chemical Week, feel that suitable protection against potentially disastrous lawsuits is worth almost any effort.

Behind this concern lies the knowledge that some accident in the use of a chemical consumer goods (e.g., cosmetics, agricultural chemicals) has increasingly been the basis of complex—and often costly—legal action.

Product liability suits were once almost the exclusive worry of food and drug makers; now, not only are many more chemical firms involved, but a wave of court decisions favoring the plaintiffs is bolstering insurance costs.

New Attitude: William J. Condon, New York attorney for Swift and Co., calls the new attitude of the courts in handling the more numerous product liability cases, the concept of "substantial justice." This means that "the court will decide a given case in accordance with its individual notion of justice irrespective of any rules of law previously thought to be control-



Swift's Condon decries courts' stand on product liability.

ling in the area."

A suit now awaiting retrial in a Texas Court of Appeals exemplifies this basis, Condon says: An employee of an engineering company conducting a seismic exploration for oil was severely injured when an explosive charge went off prematurely. The charge was made up of dynamite ticks made by Atlas Powder (but sold by Olin Mathieson Chemical under its trademark), and an electrical blasting cap made by Olin.

While no defect in these products was proved, the appeals court ruled n favor of the plaintiff against Atlas and Olin (reversing a lower court devision). Says Condon, "From the fact hat an explosion occurred, plus otherwise unsupported hypotheses as to the cause, this court would permit a jury o infer the existence of a defect in either the dynamite, or the cap, or both." Atlas now say there's a good chance that a settlement offer of 10% of the amount sued for will be accepted by the plaintiff.

The Supreme Court of Missouri remingly used similar reasoning, Condon says, in a decision against Roux Distributing Co. involving a hair dye. The plaintiff developed a rare disease after using the defendent's hairdye, and claimed that Roux was negligent for failing to warn of the

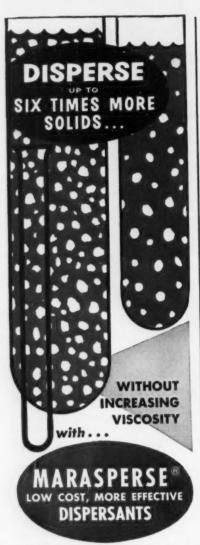
presence of paraphenylenediamine in the dye. While the chemical is known to cause severe skin reactions in certain users, it has never been scientifically linked with the plaintiff's disease.

New Look in the Law: Condon believes these decisions, among others, mean that courts are leaning toward the "insurance" concept of liability—"That is, that the burden of the loss should be placed on the party best able to spread it around, to the end that the cost of the injuries will eventually be added to the selling price of the articles and the burden will thus be borne by the public at large.

"The result of all this, naturally, is to be felt in more claims, more law suits, and more recovery. Even a perfect article will not be a guarantee against law suits or even against the imposition of liability."

Implied Warranty: Historically, liability for a product has been ascribed either to negligence by the manufacturer or to a breach of warranty—which in turn presupposes a contract between the buyer and seller.

Such direct contracts aren't feasible in mass marketing of some products, but courts may feel there is, nevertheless, an implied warranty between the manufacturer and the ultimate consumer. What's more, the manu-



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facturer may still be vulnerable for damages even though the court finds him free of negligence.

Cutter Laboratories, still in the throes of settlements over injuries stemming from its polio vaccine, was called "not negligent either directly or by inference" by the California court that returned a verdict for the plaintiffs. Said the Court: Cutter marketed vaccine "Which when given to the plaintiffs caused them to come down with poliomyelitis, thus resulting in a breach of warranty. For this cause alone we find in favor of the plaintiffs."

Total claims against Cutter (some have been settled) totalled nearly \$12 million. The firm's total insurance: \$2 million.

Insurance Arguments: This sort of experience is seen as a powerful argument for product liability insurance—particularly by its purveyors. However, Richard Elliot, manager of the general liability dept. of the National Bureau of Casualty Underwriters (New York) tells CHEMICAL WEEK that this doesn't mean that insurance companies intend to act as underwriters for untested products.

Furthermore, Elliot says that the language of liability insurance policies is being clarified, so that there will be less possibility of confusion over what the policy covers. (Example: "sistership" cases. When a defect shows up in one item, insurance companies feel it reasonable to assume that it exists in thousands of other similar items, and the insurers want the manufacturer to make a reasonable effort to draw the bad merchandise back.) Such clarification will keep a company from a false sense of security, but does not substitute any real sense of security.

Bodily insurance rates vary widely by product, quantity manufactured, conditions under which the product is made, etc. And rates often are related to sales volume. Typical rates \$5,000/claim; \$10,000/accident; \$25,000 aggregate for any number of claims within one year-can be expressed in terms of sales like this: for cosmetics such as hair dyes, deodorants, freckle removers, mascara, \$3/\$1000 sales; cosmetics such as face powder toilet water, on the same base, 75¢/\$1000; drugs, solely for animal use, 10¢/\$1000 sales; drugs -conventional medicines, pharma-

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Nice If You Can Get It: Very few chemical companies are in the enviable position of Du Pont, which "insures" its products (with very few exceptions) itself, tapping into its own legal staff and financial reserves in an emergency. It avoids many of the complaints of companies which handle product liability through insurance firms—a major gripe concerns premium rates.

Why the rates are high, of course, harks back to the frequency of cases, and the high awards made. Most stock insurance companies, of which there are several hundred, will write product liability policies. But some won't write policies on chemicals—as one insurance underwriter in Los Angeles says flatly, "We're scared to death of chemicals."

Most chemical companies' product liability policies are with the very large insurance firms. Of these, some, such as the Insurance Company of North America and Great American Insurance Co., are highly regarded in the product liability field.

Case History: One western chemical company that makes both consumer and industrial products has a master liability policy with Lloyds that illustrates one way rates can be kept to a minimum. The policy covers product liability, along with auto liability, etc. Single limit liability is \$4 million. The policy has a \$1,000 deductible clause designed to help keep rates lower, and guard against rate rises or cancellations because it avoids the rash of small claims that take as much time and trouble as big ones for the insurance carrier to settle.

Says a company spokesman, "A woman shopper might drop a bottle of bleach on the cement as she leaves the supermarket and damage her clothes, or the cap might come loose and ruin the car seat. Instead of running to the claims agent every time this happens or instead of letting the market handle the matter, we'd make a good will settlement."

He believes product liability is more important for consumer items rather than industrial items. With industrial claims, it's usually the workNOW



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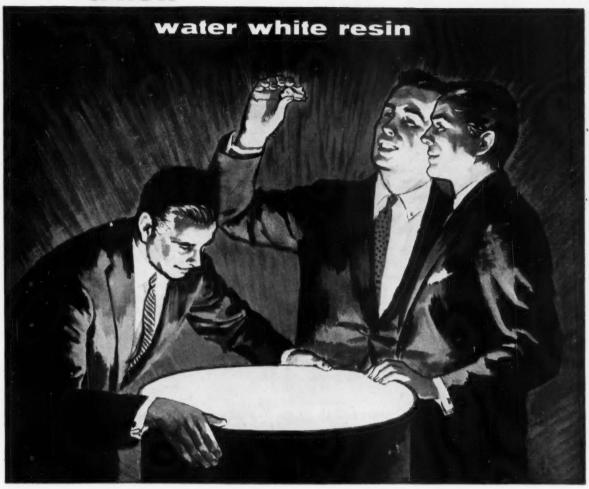
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men's compensation carrier who does the worrying. This insurance contract is renegotiated every three years. Chemicals generally are A-rated, i.e., each carrier sets his own rates based on what the traffic will bear. Product liability rates are flexible, not only because of the flexibility of the claims activity, but also because companies may shift their product line toward riskier chemicals or vice versa.

Cost Cutter: Another way to cut insurance costs has been suggested by John Liner, president of John Liner Associates, Inc. (Boston), an insurance advisory firm. He says that the present selling practice of most insurance companies requires purchasers to pay a built-in commission averaging 17%. This fee could be cut to 5% (saving U.S. businessmen about \$0.5 billion) by substituting a combination of continuous policies and direct net billing supervised by "true" insurance consultants, says Liner.

His estimate is based on \$10 billion worth of insurance written annually by about 400 stock companies and 160 mutual companies (excluding direct writers) using the commission system. Commercial lines or business insurance accounts for roughly \$4.2 billion of this amount. The 17% average commission on this \$4.2 billion comes to \$700 million. The proposed consulting fee would be 5% of \$3.5 billion (the net amount of the insurance) or \$175 million.

Whatever the future of this plan, product liability insurance will probably remain expensive. But the right policy can also prove to be a real bargain when trouble strikes.



"Even perfection is no guarantee against product liability suits."

LABOR

Settlements: Rohm & Haas and OCAW Local 4-367 have agreed on a one-year contract covering about 700 workers at R&H's Deer Park, Tex., plant, near Houston. The new contract provides a 2¢/hour wage increase. Other pacts:

• Firestone Tire & Rubber and the United Rubber Workers have negotiated a new wage settlement as well as a new master contract—believed to be the first two-year agreement between a major company and a union covering both wages and contract. Both the wage pact and the master contract terminate April 20, '63. The master contract covers 16,000 Firestone employees in plants in Akron; Des Moines; Los Angeles; Memphis; Pottstown, Pa.; Fall River, Mass.; Newcastle and Noblesville, Ind.

Under terms of the wage agreement, the company will grant a 7½ ¢/-hour increase to employees of the five tire plants at Akron, Des Moines, Los Angeles, Memphis and Pottstown, and a 3½ ¢/-hour increase to employees of the three industrial products plants at Fall River, New Castle and Noblesville, effective June 5, '61.

On June 11, '62, the tire plant employees will receive another 7¢/hour increase, and non-tire plant employees will get a 4¢/hour raise. The new agreement also provides an additional paid holiday for all plant employees; the holiday will be determined at the local plant level.

Under the master contract, supplementary employment benefits have been extended to cover the number of weeks provided by state unemployment compensation, up to a maximum of 39 weeks. This will also cover the present temporary extension under the federal temporary emergency unemployment compensation law. Maximum benefit payments have been increased by \$5/week.

• URW Local 232 has settled for wage increases ranging from 6-11¢/-hour for 1,300 employees of Goodyear Tire and Rubber Co. (Canada) Ltd. at Toronto.

• The Dundee Cement Co. (Dundee, Mich.) and the United Cement, Lime and Gypsum Workers International Union have signed a two-year contract that provides pay increases and additional benefits amounting to 18½ \$\epsilon/\$ hour during the first year and 14\$\epsilon/\$ hour during the second year.

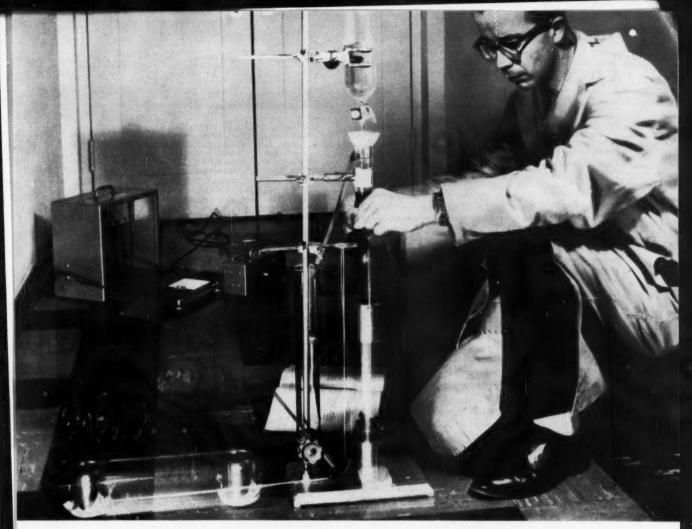
Layoffs: Labor cutbacks at the Du Pont plant in Niagara Falls, N.Y., will be more extensive than anticipated, according to plant manager Don A. Miller. In a letter to employees, Miller said the company now expects that about 600 fewer employees will be required to operate the plant by the end of this year. Last year it had been anticipated that about 450 jobs would be eliminated because of the shutdown of ADN (adiponitrile)—a nylon intermediate—and related operations.

With sales causing slumping new concern about costs, the 600 figure seems more accurate, says Miller. He expressed hope that business would improve in the next few months and said that "strong technical effort is continuing toward the goal of finding other uses for facilities which will be idled."

• The Atomic Energy Commission is terminating 950 workers at atomic plants in Oak Ridge, Tenn.; Portsmouth, O.; and Paducah, Ky. AEC says 160 have been laid off at the gaseous diffusion plant at Oak Ridge and 450 others will be terminated by July 1. About 90 were laid off at Paducah and 250 will lose jobs at Portsmouth. Layoffs, says AEC, are result of improved efficiency in operating the plants, among other reasons.

Strike Vote: A strike has been approved by 360 production workers and laborers at Goodrich-Gulf Chemicals plant in Port Neches, Tex. No over-all wage increase is involved in contract discussions, according to L. L. Crane, secretary of OCAW Local No. 4-228. He says talks are snagged on working conditions, fringe benefits. No date for walkout has been set.

the International Chemical Workers (AFL-CIO) has been retained as bargaining agent in an NLRB election at the Hopewell, Va., plant of the National Aniline Division of Allied Chemical Corp. United Mine Workers was defeated by a vote of 181 to 128.



Comparative slip resistance of floor wax is determined by this special apparatus devised by Neville chemists. Water enters top container by a constant

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To show the adaptability of Nevillac, Neville Chemical Company's hydroxy resin, as a partial replacement for many expensive natural waxes, a large number of tests were made on floor waxes containing Nevillac. The results were most gratifying. Nevillac was found to promote a marked improvement in gloss, better-than-average non-slip quality, good water resistance yet sufficent removability and satisfactory hardness.

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136 CHEMICAL WEEK May 6, 1961

KEY CHANGES

Wilbur G. Malcolm to chairman of the board of directors and chief executive officer; Kenneth H. Klipstein to president; George R. Martin to chairman of the executive committee, American Cyanamid Co. (New York).

James H. Gardner to vice-president, National Research Corp. (Cambridge, Mass.).

R. H. McGough to president, Western States Chemical Corp. (Los An-

L. J. Forrest and Michael A. Brown to vice-presidents, Rayonier Inc. (New

Laszlo J. Bonis to executive vicepresident, Ilikon Corp. (Natick, Mass.), research and development firm.

William G. Hendrickson to vicepresident, Ayerst Laboratories, divivision of American Home Products

Arthur H. Rude to chairman of the board; W. E. Zisch to executive vicepresident, Aerojet-General Corp. (Azusa, Calif.), subsidiary of General Tire & Rubber Co.

Wyly M. Billing and John H. Schaefer to the board of directors, Michigan Chemical Corp. (St. Louis,

George N. Brunt to vice-president and general manager, Southern Latex Corp., subsidiary of International Latex Corp. (Dover, Del.).

Ernest M. Weber to vice-president research and development, Chas. Pfizer & Co., Inc. (New York).

Wesley H. Sowers to executive vice-president, Chemical and Metallics Division, Vulcan Materials Co. (Birmingham, Ala.).

Conrad G. Hurlimann to vicepresident and member of the board of directors, Geigy Chemical Corp. (Ardsley, N.Y.).

Paul Carus and M. Blouke Carus to vice-presidents, Carus Chemical Co., Inc. (LaSalle, Ill.).

Louis M. Hague to chairman of the board and chief executive officer, Hanson-Van Winkle-Munning Co. (Matawan, N.J.), electroplating chemical maker.

Tracers

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Salesman for Floride-National well known Chemical Company, largest in field needs extremely aggressive salesman with several years experience in selling full line of industrial chemicals. For an in selling full line of industrial chemicals. For an experienced salesman with exemplary record, we offer good salary, commission, expenses and ear with unrivaled opportunity anywhere for a good producer. Send snap shot, resume and tell us you'd like to work and work hard in this land of sunshine. Write P. O. Box 27, Station G. Jacksonville, Florida. Our employees know of this advertisement and your application will be held confidential.

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Consultant, presently in Europe, returning early May, Will depart again June 8, to attend Achema Exhibition in Frankfurt. Will accept commissions, undertake market investigations, negotiate licens-ing, joint venture agreements, acquisitions. SS-6609, Chemical Week.

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CHEMICALS FOR SALE

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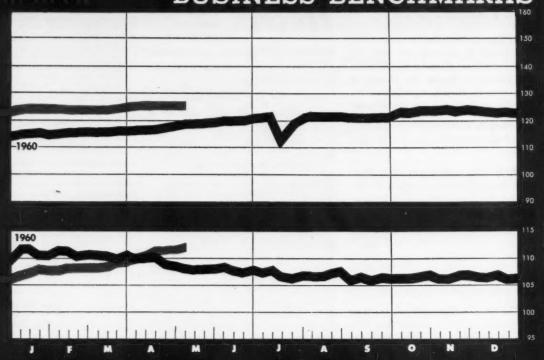
CHEMICALS WANTED

Surplus Wanted—Chemicals, Pharmaceuticals, Oils, Acids, Plasticizers, Resins, Dyes, Solvents, Figments, Etc. Chemical Service Corporation, 96-02 Beaver Street, New York 5, N.Y. HAn-over 2-6970.

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BUSINESS BENCHMARKS

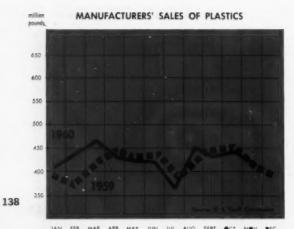


MAY 6, 1961

WEEKLY BUSINESS INDICATORS	Latest Week	Preceding Week	Year Ago
Chemical Week output index (1957=100)	126.5	126.2	120.6
Chemical Week wholesale price index (1947=100)	113.1	112.7	108.9
Stock price index (12 firms, Standard & Poor's)	50.67	51.36	50.39
Steel ingot output (thousand tons)	1,784	1,748	2,238
Electric power (million kilowatt-hours)	14,311	14,434	13,567
Crude oil and condensate (daily av., thousand bbls.)	7,244	7,248	6,982
MONTHLY INDICATORS—PRODUCTION (1957=100)	Latest Month	Preceding Month	Year Ago

MONTHLY INDICATORS—PRODUCTION (1957=100) (Unadjusted)	Latest Month	Preceding Month	Year Ago
All manufacturing	103	102	111
Nondurable goods manufacturing	112	111	113
Durable goods manufacturing	96	96	110
Chemicals and allied products	120	119	122
Industrial chemicals	125	125	129
Petroleum and coal products	103	105	102

CHEMICAL CUSTOMERS CLOSE-UP.





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Powder, Reagent
Aluminum Fluoride,
Crystal, Tech.
Ammonium Fluoborate,
Crystal, Tech.
Ammonium Fluoride,
Crystal, Reagent &
Crystal, Tech.
Antimony Pentafluoride
Barium Fluoride, Powder,
Reagent, & Powder, Tech.
Bismuth Trifluoride

Sodium Fluoride,
Powder, Reagent, A.C.S.
Sodium Zirconium Fluoride
Strontium Fluoride
Sulfur Hexafluoride
Tantalum Pentafluoride
Tellurium Hexafluoride
Titanium Tetrafluoride
Tungsten Hexafluoride
Zirconium Tetrafluoride

Potassium Fluoride, Anhy., Purified Potassium Titanium Fluoride Potassium Zinc Fluoride Potassium Zirconium Fluoride Selenium Hexafluoride Silicon Tetrafluoride, Gas Silver Difluoride Sodium Fluoborate, Crystal, Tech.

Boron Trifluoride,
Compressed Gas
Boron Trifluoride Complexes
Bromine Pentafluoride
Bromine Trifluoride
Cadmium Fluoride
Calcium Fluoride,
Powder, Reagent
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Niobium Pentafluoride (Columbium Pentafluoride) Potassium Aluminum Fluoride Potassium Bifluoride, Crystal, Tech. Potassium Ferric Fluoride, Powder, Purified Potassium Fluoborate, Crystal, Tech. Potassium Fluoride, Anhydrous, Reagent

Chromium Fluoride, Powder Chromium Potassium Fluoride Cupric Fluoride, Powder, Tech. Fluoboric Acid Fluosulfonic Acid Hydrofluoric Acid lodine Heptafluoride

Iodine Pentafluoride Lead Fluoride, Purified Lithium Fluoride, Powder, Reagent Magnesium Fluoride, Purified Mercuric Fluoride Metallic Fluoborates Molybdenum Hexafluoride Nickelous Fluoride, Crystal, Tech.

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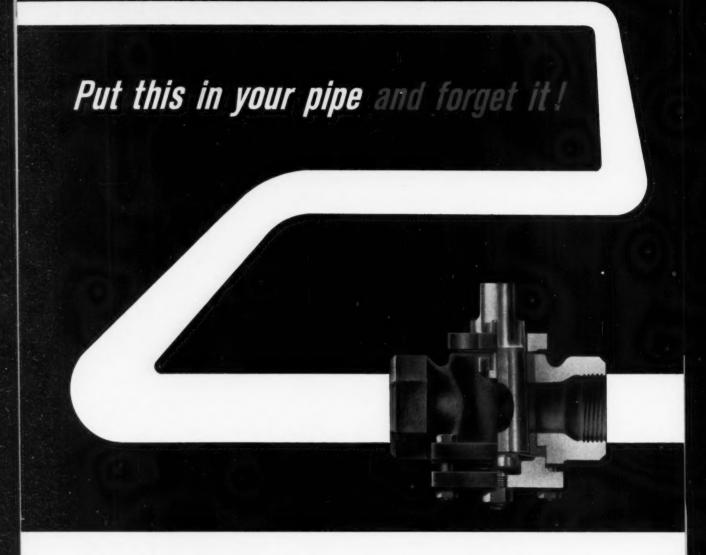
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